2016

Fine Woodworking & Fine Homebuilding's

TOOL GUIDE

BEST VALUE
EDITORS' CHOICE
BEST OVERALL

An inside look at what the pros use



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Best tools of the year



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Over 230 tools tested

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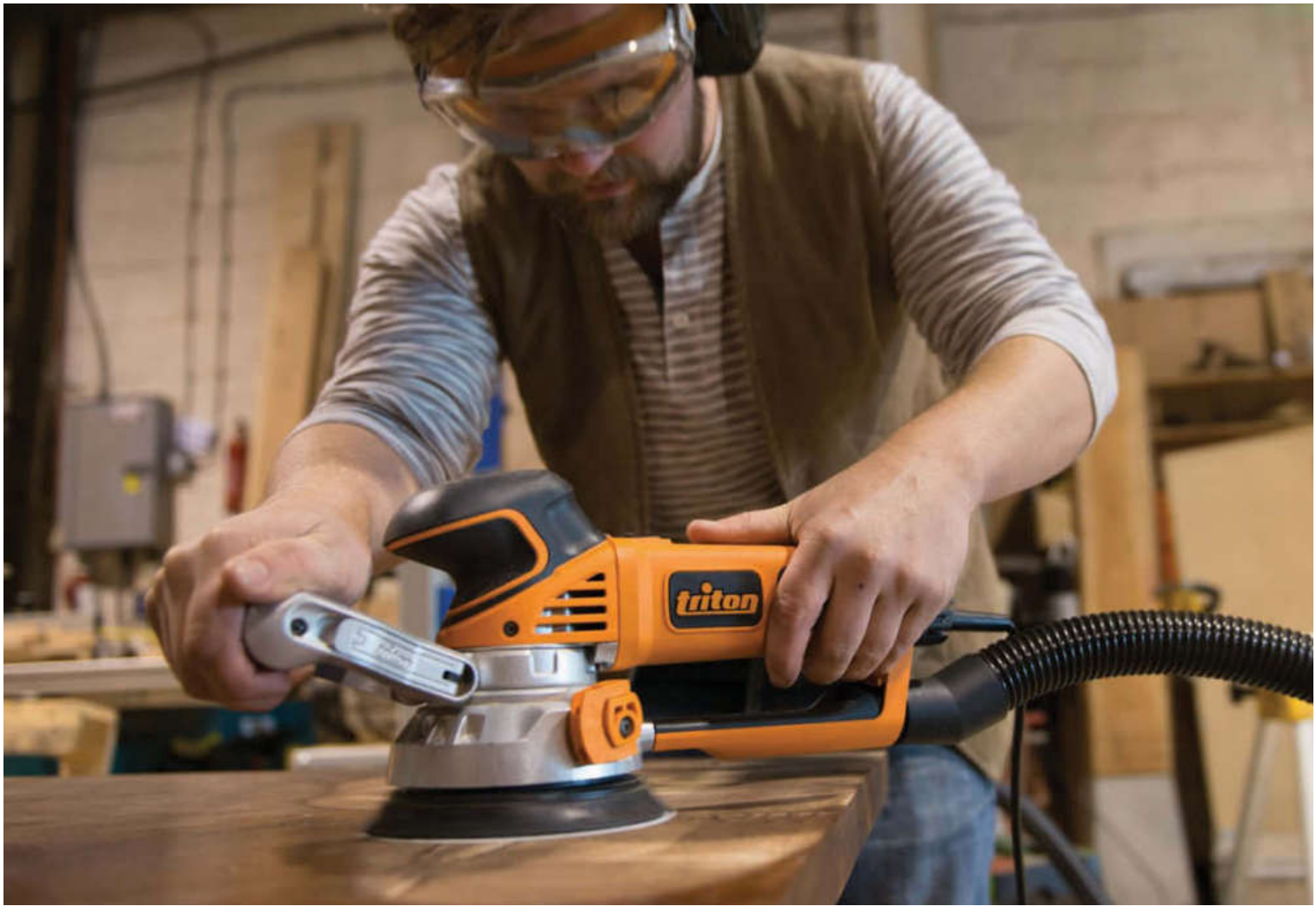
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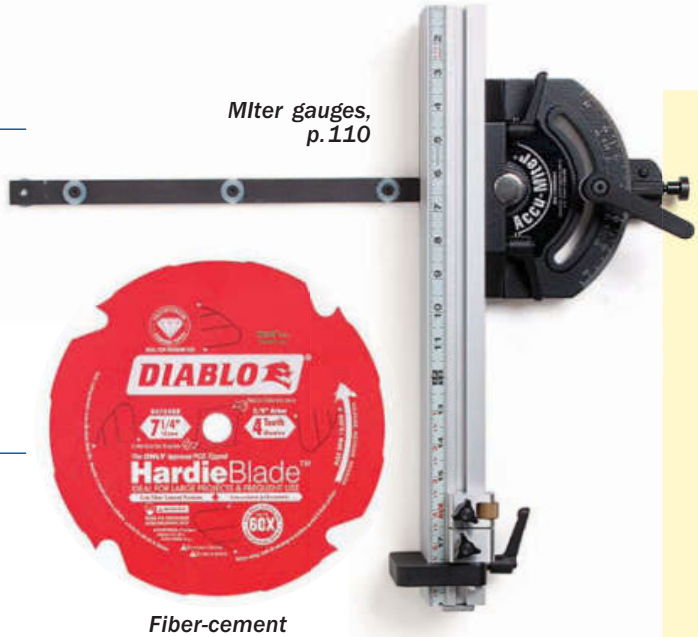
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Backsaw Basics

These simple exercises can transform any hopeful hand-tool user into a bonafide backsaw master.





VIDEO

Router Reset

Don't miss our tips for smoother, safer routing—including techniques for how to hold work, how to mount a bit securely, and how to keep those bits clean and ready to cut.





VIDEO

The Right Way to Resaw

Get tips from a master on how to set up any machine for arrow-straight resawing. From blade selection and fence alignment to out-feed support and dust collection—it's all here.

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Unlock your tablesaw's full potential with furniture maker and teacher Marc Adams. In this Video Workshop series, Adams walks you through a variety of essential techniques, including how to:

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- Construct a custom crosscut sled
- Cut precise joinery



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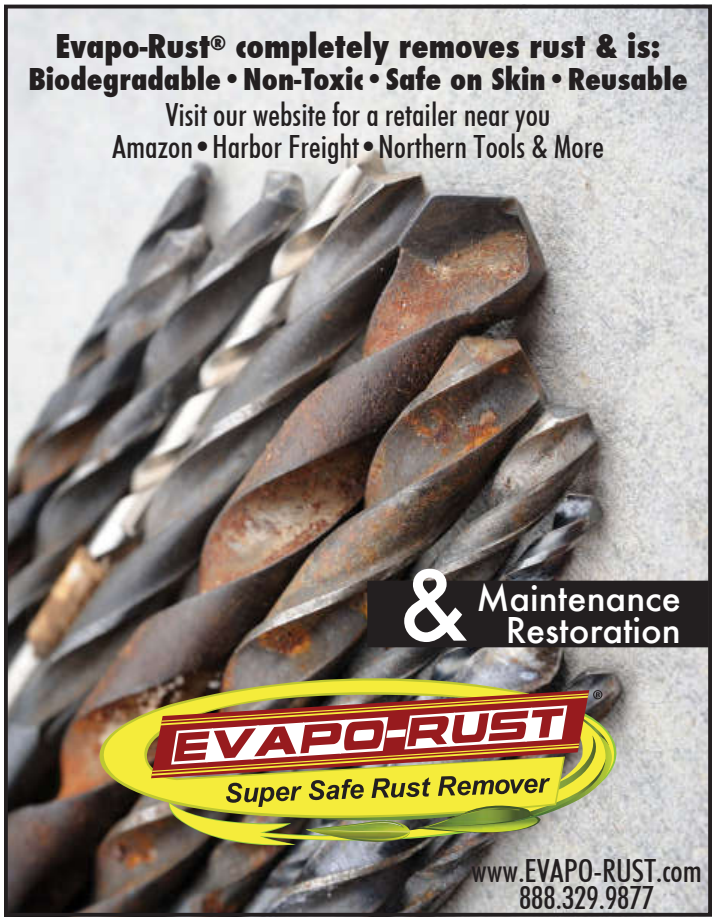
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FineHomebuilding.com
Product Manager — Alex Jonas
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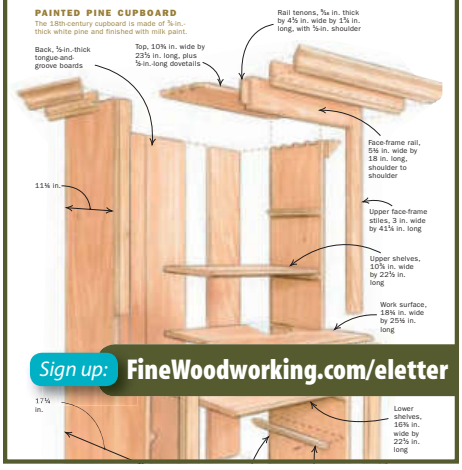
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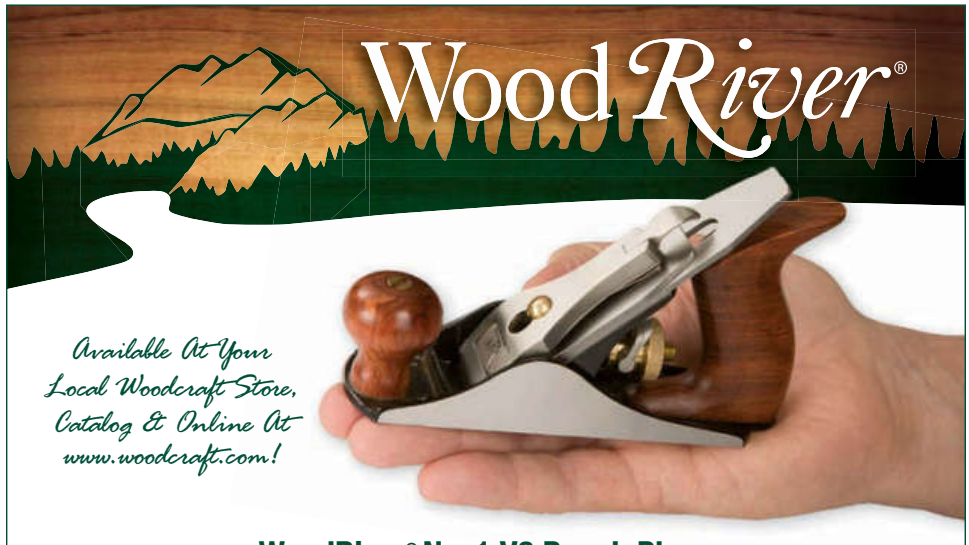
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CHOOSE WISELY, WORK WELL

I've spent hundreds of hours in dozens of shops photographing woodworkers working. I've also logged plenty of my own shop hours. My house is an endless pit of projects, some that I tackle myself and some that I hire out to specialized contractors. The one thing all these shops, people, and projects have in common is the tools.

We all have a variety of tools to do specific tasks, and (gifts aside) we all came by them in the same way, by making an informed choice about which tool was the best for our circumstance. Has anybody ever walked into a store looking for a router or tablesaw, for example, and said to the salesperson, "Eh, I don't care what brand it is or how much it costs, you decide which one I should buy"? I doubt it.

Buying a hand tool or power tool can be a difficult, long-term decision based on a lot of factors. First, you have to figure out what you want from your tool. Is it more important to you and your work that your drill press has the most power possible, or that the speed changes are as fast and easy as can be? Do you need a machine that excels in both areas? Once you've hashed that out, you have to sift through the written material and figure out which tool gives you what you want. And then, of course, you must decide if you can afford that tool. It can be mind-boggling.

Let us help simplify the process. In this *Tool Guide*, we've rounded up the tools and the experts to test them. We give you unbiased comparisons of tools in a variety of categories—from hand tools to power tools to machines. And then we add reader input to the mix. We've done the hard work so you can focus on creating and building.

Anissa Kapsales, editor
Taunton's 2016 Tool Guide







Three different awards

Look for these logos in each of our tool tests. Two are from our editors and writers, and one is determined by our readers.

BEST OVERALL
This award goes to the best overall performer, all things considered.

BEST VALUE
This one makes price a stronger consideration, highlighting best buys in every tool category.

READERS' CHOICE
This award is based on our survey of more than 14,000 of our readers.

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Digital Ad Sales Manager — **Noelle Kennedy** 203-304-3530 nkennedy@taunton.com

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Best Tools

The experts at *Fine Woodworking* and *Fine Homebuilding* test hundreds of new tools each year. Here are our favorites from this year.

Small drill packs a punch

Bosch got many things right with their new compact drill. First, it weighs just 3 lb. and is only 7½ in. long, so it's a great size for furniture making. Plus, with an 18-volt battery and a ½-in. chuck, it's capable of heavy-duty work.

We were particularly fond of the trigger, which offered superb speed control that made it very easy to drive small screws. A 21-step torque clutch lets you dial in the drill to handle any job, from tough to easy. The drill is easy to hold in any position, and the LED light is properly located to shine on the bit and screw. You can turn on the light without triggering the motor. The drill comes with two 1.5 amp-hour lithium-ion batteries, which had impressive life, but batteries with longer lives between charges (2, 4, and 5 amp-hour) are available.



18-VOLT DRILL/DRIVER BY BOSCH

- **DDB181-02 P100**
- **$120**

Simple board straightener



There are several products designed to help persuade bowed deck boards into alignment for fastening, but none is as elegantly simple as the Deck Wedge. Designed to fit over a deck joist, the U-shaped wedge has beveled edges set 1⅜ in. apart, just enough to slice into and grab the faces of the joist as the wedge is hammered into place. The wedge is backed by a 3/16-in.-thick steel plate and can be whacked to whatever depth is necessary to close the gap between deck boards, but it has a maximum 1¼ in. of travel. Driving the wedge too far will make it difficult to fit the claw of your hammer under it for removal. The angled face of the Deck Wedge is nonmarring, so it can be used on hardwoods and synthetics alike. We can testify to the durability of the striking surface; we beat it forcefully and repeatedly on a recent ipé decking installation, yet it shows little evidence of use. It's $30 well spent for a tool that has no moving parts and very little learning curve, that weighs less than 2 lb., and that takes up almost no space in a tool kit.



DECK WEDGE BY KRANKER TOOLS

- **$30**

Photos, except where noted: staff; bottom photo: courtesy of Krankertools

Fine WoodWorking

To contact us:
Fine Woodworking
The Taunton Press
63 South Main Street
PO Box 5506
Newtown, CT 06470-5506
Tel: 203-426-8171

Send an email:
fw@taunton.com

Visit:
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Dust mask clears the air

Whether you're in your shop or on the job site, good dust collection is key. You may find yourself needing to wear a dust mask, and we found that the Elipse P100 is a great one.

The P100 is comfortable, light, and easy to put on and take off. It creates a very good seal around the face, and the filters are easy to change. Its NIOSH rating (National Institute for Occupational Safety and Health), as its name suggests, is P100, which means that it captures 99.97% of airborne particles and is strongly resistant to oils. All in all, the Elipse P100 is a great mask.



DUST MASK BY ELIPSE

- **P100**
- **$30**



LASER MEASURING DEVICE BY BOSCH

- **GLM 15**
- **$50**

Ultracompact laser measuring tool

Laser measuring devices use a projected laser beam to calculate distances, allowing you to get accurate, single-handed measurements very quickly. You can use them to measure room sizes, cabinet runs, and ceiling heights. Recently, we were given a chance to try the Bosch GLM 15. At 1⅜ in. wide by ⅞ in. deep by 3⅞ in. long and weighing just under 3 oz. (including its two AAA batteries), the tool's most notable feature is its small size.

The manufacturer claims a range from 6 in. to 50 ft. with accuracy to within ⅛ in. Units are expressed either in feet and inches to the nearest 1/16 in. or in meters to three decimal places. All measurements are from the base of the unit to the object the laser dot is projected on.

A single press of the tool's only button turns the device on and projects the laser dot on your target. If you move the device, the display shows a continuously updated measurement, which is useful for stepping off dimensions or for finding the center of a long wall, for example. Pressing the button a second time holds the current measurement so that you can record it or make a mark. The ⅞-in.-sq. LCD display shows the current measurement and the previous measurement.

To check the accuracy of the GLM 15, we compared sample measurements with ones we took with a 25-ft. Stanley tape, a Lufkin folding ruler, and an older Bosch laser measuring device. The measurements were consistent within 1/16 in. of each other. We did find greater discrepancies when we measured a countertop with a tile backsplash. In this test, the variation between the GLM 15 and the other measuring tools increased to ¼ in. because of the reflective quality of the glazed tile.

The instructions warn about measuring to transparent, reflective, porous, or rough surfaces, so you should put a piece of blue tape on difficult surfaces before measuring.

One complaint we have is with the display. You need adequate light to read the screen, which is not back-lit. Fractions are displayed on the far right of the screen in the shadow of the case.

The GLM 15 won't replace full-function laser measuring tools with indirect measuring, angle measuring, and Bluetooth connectivity, but its compact size and low price make it a winner.

Bottom photo: courtesy of the manufacturer



Tool-toting backpack

Carrying a tool box, bucket, or bag any distance can be a real pain, so some tradespeople carry their tools and gear in a backpack. Having your gear on your back has the additional benefit of freeing your hands for carrying other tools or supplies. The recently introduced tool backpack from Milwaukee has 35 organizing pockets for hand tools and accessories as well as a larger storage area for small power tools, a laptop, or a lunch. The rig has a waterproof, hard-plastic base that holds the bag upright, making tools and gear easy to see and access when you're working.

Thoughtful details such as comfortable straps, a water-bottle pocket, and large, sturdy zippers round out the package. It comes with a lifetime warranty.

JOBSITE BACKPACK BY MILWAUKEE

- **$100**

A truly quiet air compressor

What good are air tools if your compressor is so large and cumbersome, or so loud, that you don't want to deal with using it?

Rolair's JC10 (1 hp, 2½-gal. tank) hand-carry compressor is a pleasure to use. It is unbelievably quiet. Standing next to the compressor and taking readings at ear level, we measured its noise at 67 db. At 10 ft. away, the noise level dropped to 62 db. That's quieter than your alarm clock and normal street noise. You can easily carry on a conversation without raising your voice while it's running. At just 39 lb. it's also light, so we had no trouble carrying it to a job site.

We tested the JC10 quite a bit making jigs for the shop and for hanging molding on site. It has no problem keeping up with the nailer.



AIR COMPRESSOR BY ROLAIR

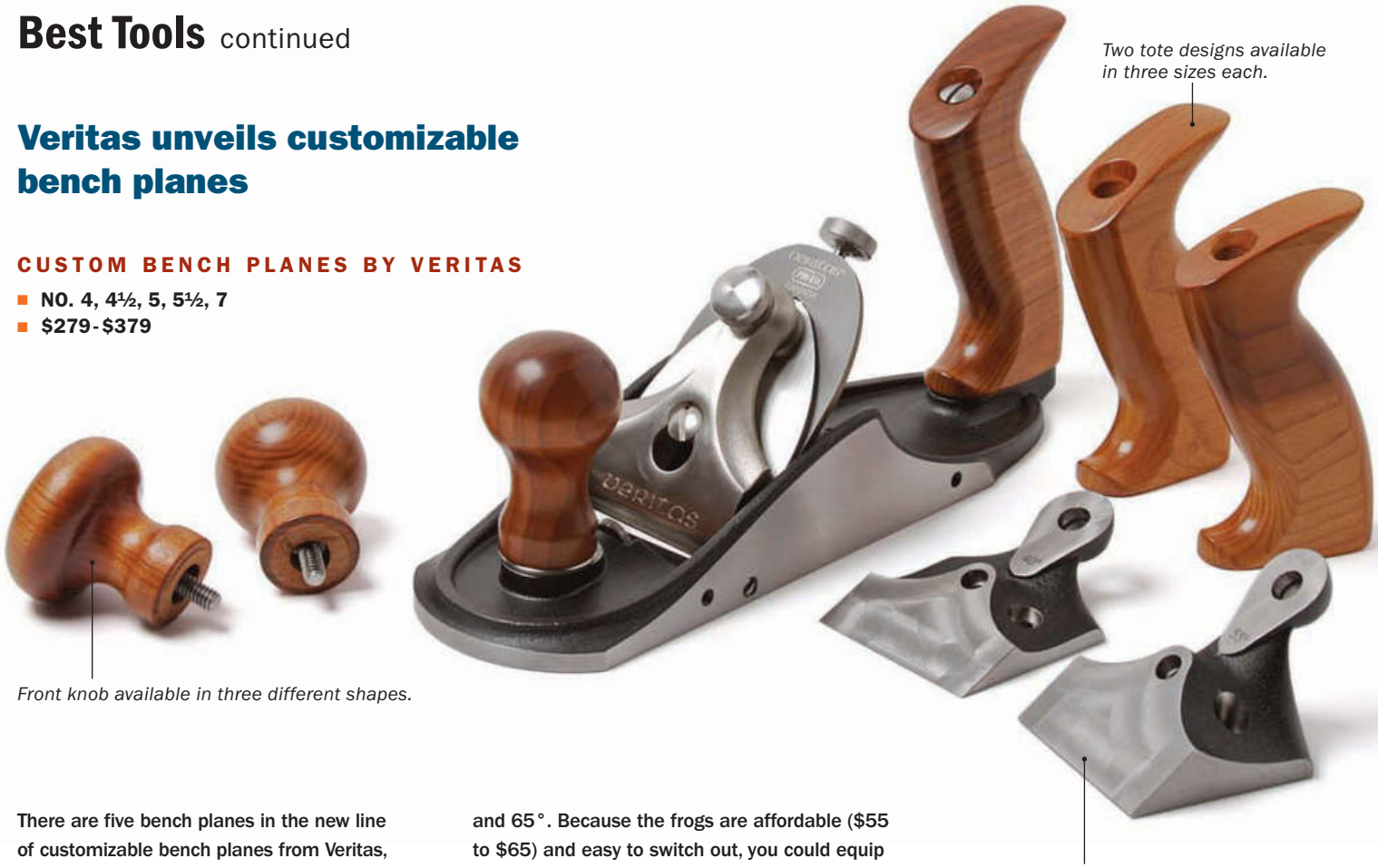
- **JC10**
- **$240**

Top photo: courtesy of the manufacturer

Veritas unveils customizable bench planes

CUSTOM BENCH PLANES BY VERITAS

- **NO. 4, 4½, 5, 5½, 7**
- **$279-$379**



Two tote designs available in three sizes each.

Front knob available in three different shapes.

Three standard frog angles (40°, 45°, and 55°). Custom angles between 40° and 65° (in ½° increments) available for an additional $10.

There are five bench planes in the new line of customizable bench planes from Veritas, and over the past few months we've been using three of them (No. 4½ smoother, No. 5 jack, and No. 7 jointer) daily in the shop. They perform extremely well.

With these planes, you can choose from among three knob options and six for the tote (two designs in three sizes each). Also, in addition to three standard frog angles, you can have a frog made at any angle between 40° and 65°. Because the frogs are affordable ($55 to $65) and easy to switch out, you could equip a single body with different frogs to dial it in for the work at hand: Use a standard angle (45°) for most work. Add a low-angle frog (40°) to smooth softwoods and trim end grain. Switch to a high angle (50°) for figured woods.

But these planes are much more than tricked-out versions of a traditional design. Some great innovations make them easier to use, too. Gone are the days of moving the frog to adjust the mouth for finer and rougher shavings. Instead, the planes have an adjustable mouth (similar to those found on block planes), and the frog is stationary. This is a much quicker and easier way to dial in the mouth opening.

And the cap-iron screw has been replaced by a "blade carrier." The chipbreaker, which is secured to the blade carrier with an Allen-head screw, is taken off for sharpening. The blade carrier, secured to the blade with a second Allen-head screw, stays attached to the blade during sharpening. It acts as an indexing pin so that when you put the chipbreaker back on, its distance from the cutting edge is already set.

Out of the box, the planes needed very little work. Just a few minutes honing on a fine polishing stone and you'll be planing beautiful, light shavings.



Adjustable mouth. *Changing from a narrow opening for light shavings to a wide one for heavy work is quick and simple because you don't have to move the frog, as you would on traditional bench planes.*



Easy-to-set chipbreaker. *The chipbreaker registers on a round "blade carrier" attached to the blade, so you can quickly reattach the chipbreaker after sharpening the blade.*

Watch a demo



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Jig takes the hassle out of dowel joints

Jessem's newest dowel jig has two features that set it apart from other dowel jigs. First, you can adjust the plate that holds the drill guides in ⅛-in. increments without removing the jig from the workpiece. This allows you to drill parallel rows of dowel holes quickly. Second, a slot on one end of the plate is aligned with the center dowel hole drill guide, which makes it very easy to drill mating holes for an edge glue-up.

After drilling holes in the first edge and putting dowels in them, clamp the mating board to the first board face to face. Then place the slot in the jig over the dowel and drill a hole in the center bushing. This guarantees that the hole in the second board is in perfect alignment with the one in the first board (and saves you a ton of meticulous and tedious layout). The jig also comes with alignment pins for drilling a series of holes in a straight line.

We tested the master kit version of the jig, which includes everything you need to drill holes for ¼-in., ⅜-in., and ½-in. dowels. This is a versatile jig that's easy to use. Each dowel size requires different-size drill guide bushings, but switching between the guide plates is easy, because you need only remove four small screws with a provided Allen wrench. The drill bits were sharp and the depth collars stayed put. The jig has helpful hash marks for locating the dowel hole centers.



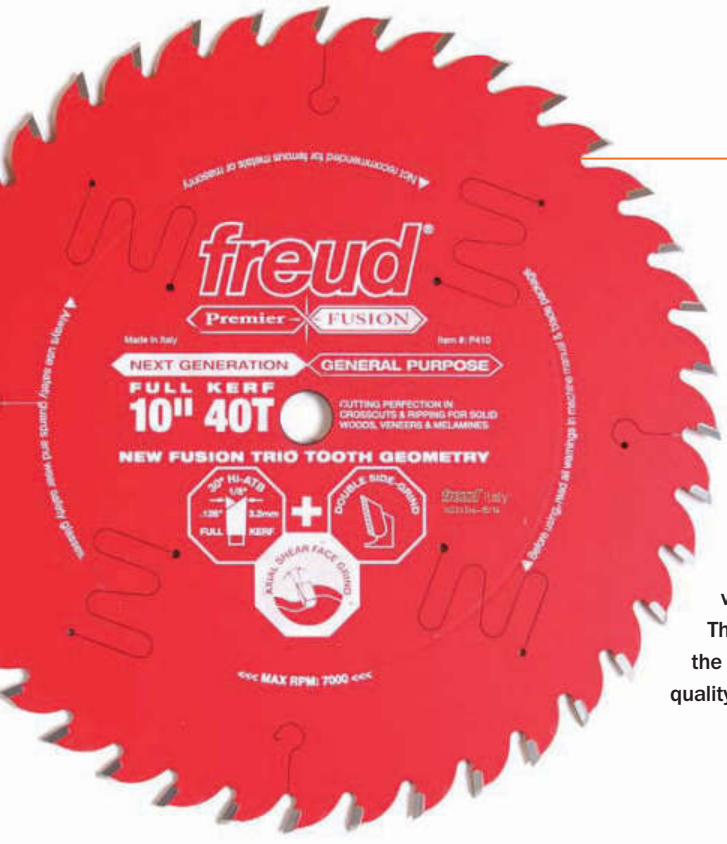


Automatic alignment. *The jig straddles a dowel put into the first drilled hole (above), which ensures that the hole in the mating workpiece will be in perfect alignment when drilled using the center bushing (right).*



DOWEL JIG BY JESSEM

- **08350 MASTER KIT**
- **$200**



TABLESAW BLADE BY FREUD

- **P410**
- **$84**

Combination blade is a great value

We put the Freud P410 combination blade in our tablesaw for the last few months so we could give it a real-world test. During that time we've ripped and crosscut oak, cherry, butternut, and maple in various thicknesses for a variety of projects. The Freud blade turned out to be a solid performer. It cut vibration-free and left clean, tearout-free surfaces on both rips and crosscuts. The only slight drawback was that it seemed to require a bit more force to push the stock through ripcuts. However, at $84, the Freud is a good value for a top-quality combination blade. A thin-kerf version, the P410T, is available for $75.

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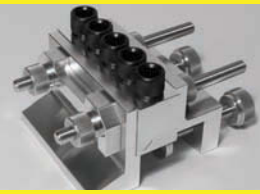
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On the Horizon

Some of these tools weren't available for testing until after the *Tool Guide* went to press, so we haven't had a chance to put all of them through their paces. But if you are shopping for something in these categories, give them a close look. Note that some prices may change.



SAWSTOP JOBSITE

- $1,300

Finger-saving tablesaws

According to the Consumer Product Safety Commission, 67,000 people are injured every year using tablesaws, resulting in 33,000 emergency-room visits, 4,000 amputations, and $2.3 billion spent on medical bills, lost wages, and pain and suffering. Back in 2002, SawStop demonstrated its first flesh-sensing, blade-stopping tablesaw to prevent finger-amputation injuries. Since then, professional woodworkers and hobbyists alike have lauded the company's cabinet and contractor saws for their high quality and reliability. SawStop has been promising a portable job-site tablesaw like those favored by contractors and DIYers, and in February, the saw went on sale. Within weeks of the tool's introduction, power-tool giant Bosch announced it would be introducing its own finger-saving saw this fall.



BOSCH REAXX

- $1,500

Photos courtesy of the manufacturers



Portable, convenient, and cordless



Given their relatively stationary nature, even on the job site, it's easy to be skeptical about cordless miter saws. But DeWalt says its DCS361 (a 20-volt-max, lithium-ion, 7¼-in. sliding miter saw) can alleviate that. It is light and easy to carry. Weighing in at 31.6 lb. with the battery, the new saw can cut an average of 183 pine 2x4s in a single charge, according to the manufacturer. As a bonus, an integrated XPS blade light casts a shadow showing where the blade will cut, and a stainless-steel miter detent plate makes it easy to adjust the saw. The bare tool comes with a dust bag, hold-down clamp, and 40-tooth blade. The kit version comes with the battery and charger.

DEWALT CORDLESS MITER SAW

- DCS361
- $319 BARE UNIT
- $399 KIT

TITAN FLEXSPRAY HANDHELD SPRAYER

- $490



The power of airless meets the precision of HVLP

Titan, a leader in spraying technology, introduced its new FlexSpray HandHeld sprayer this summer. The maker claims the versatile tool handles all types of coatings for interior, exterior, and fine finishing jobs, and adds that the sprayer is powerful enough to spray unthinned latex, yet nimble enough to spray lightweight coatings like lacquer and stain.

A nifty feature, the sprayer's quick-change system allows the user to change front ends with a simple twist. In a matter of seconds, one front end can be disconnected and another reconnected, which is perfect for larger jobs, fast color changes, and end-of-job cleaning.

Impact driver has built-in downshift mechanism

MAKITA 18V BRUSHLESS IMPACT DRIVER

- XDT09M
- $359

This year Makita unveiled an 18-volt lithium-ion three-speed impact driver that, according to the company, features superior batteries and more torque and speed than previous models. The driver's unique "quick-shift mode"—engaged by a push button at the base of the handle—enables an automatic electronic controller to downshift and reduce rotation and impact speed prior to driving the screw into place. The company says this feature puts an end to stripped screw threads, broken screws, and damage to work.



Thoughtful sander puts a priority on comfort



DEWALT RANDOM-ORBIT SANDER

- DWE6423K
- $80

Dreading your next marathon sanding task? DeWalt says its new user-friendly 5-in. variable-speed random-orbit sander will make the job more comfortable. According to the manufacturer, the sander minimizes vibration with a separate counterweight that provides the user with comfort and control. It also has an expanded rubber overmold to increase comfort during use. DeWalt says dust collection has been improved with a rubber dust skirt that helps keep dust from escaping around the pad. The dust-collection port also has a one-handed locking dust bag that works with DeWalt dust extractors.



Lose the cord and go where the work takes you

Working the power cord around a 4x8 sheet of plywood while you're cutting it down can be frustrating. That's where Festool's new cordless track saw comes in. The company says the tool is every bit as capable as its corded counterpart, and can zip through more than 328 ft. of sheet goods on a single charge.

The saw also features a flexible dual battery concept, which allows users to operate the saw with two 18-volt battery packs for maximum power or one 18-volt battery pack for lower weight.

FESTOOL TSC 55 CORDLESS TRACK SAW 561 702

- $825



Sleek lathe design has it all

Laguna Tools' new REVO 18/36 lathe has a headstock with a cone-shaped nose that allows access to the back of the bowl while turning. This lathe has a 9-in. swing over the bed, 36 in. between centers, digital readouts, a triple-index plate, and an ergonomically designed tool rest. It also includes a 12-in. swing-away extension that allows you to park the tailstock, and a 20-in. multifunction extension that enables the user to mount the work perpendicular to the headstock for added versatility.

LAGUNA REVO 18/36 LATHE

- **$2,500**

Mortising made easy

The smart features of Rikon's new benchtop mortising machine are designed to make it simple to cut lots of mortises. Among these features is a wide cast-iron base with pull-out side extensions that provides extra support for the workpiece. Innovative roller clamps keep the stock against the back fence but allow the work to move left or right without having to unclamp the rollers. You can easily position the fence with a geared lever, and the operating handle is spring-loaded so it can be quickly adjusted to different positions by angling it away from a toothed shaft.



RIKON MORTISING MACHINE

- **34-255**
- **$350**

A Homeowner's Tool Kit

Handle everything from emergency repairs to serious home improvement



If you own a home, apartment, or condo, or even if you rent, you need a tool kit. If you've gone as far as purchasing an annual collection of tool reviews, you probably also know that the right tools make the difference between a row of shelves and a string of expletives.

We've put together an essential homeowner's tool kit for everything from emergencies to basic remodeling. Why call a contractor to change a light fixture or paint a room when you can do it yourself and save money?

When cruising local home centers and hardware stores for the tools you see here, we went for brands and models we've had good experiences with. But the point is the type of tool, not the make. Quality does count, so it pays to avoid the low end in most cases. You'll spend close to $1,000 for the entire arsenal, but you don't have to buy it all at once. And you'll save at least that much every year you own them, by tackling repairs and upgrades on your own instead of making phone calls (and waiting).

Asa Christiana, special projects editor at Fine Woodworking, *and Patrick McCombe, associate editor at* Fine Homebuilding, *contributed to this article.*

The core kit

These are the generalist tools, the ones you'll use for all sorts of tasks. Some are designed for electrical or plumbing jobs but are much more versatile than that, so we've included them in the essential kit.



MIDSIZE TOOLBOX, $20-$30

A toolbox that's roughly 24 in. long will store most of your tools safely, without breaking your back when you have to drag it out of the garage. Look for durable latches and an interior tray.

BUCKET ORGANIZER, $10-$20

These hanging tool bags fit over a standard 5-gal. bucket and are a perfect companion for your toolbox, because they let you bring a specific set of tools to a specific job. There are lots of outside pockets for hand tools and a big inner space for earmuffs, boxes of screws, extralong tools, or whatever else you need for the job at hand.

20-OZ. RIP-CLAW HAMMER, $28

For nails you'll need a hammer, of course. We recommend a 20-oz. model, which will handle everything from the big nails that are sticking up on your front porch to little brads and staples. The rip-claw design does a better job than a curve claw at pulling big nails.



UTILITY SCISSORS, $6

A pair of thick utility scissors will cut everything from sheet metal to plastic, including that maddening packaging that most of these tools are sold in.



8-IN. MOLDING BAR, $10

Your hammer won't pull out nails that are even slightly below the surface, but this tool will. At one end is a small cat's paw, which can be driven into the wood with a hammer. At the other end is a flat pry bar.



NAIL SETS, 3-PACK, $6

When you install trim, you'll want the nail heads a little below the surface for a clean look. A nail set is the right tool for the job, but it leaves a little hole behind. Use the right nail set to keep that hole as small as possible.



UTILITY KNIFE, $6

A utility knife is a must. Make enough passes, and this thing will go through carpet and almost anything else.

Photos: Kelly J. Dunton

The core kit continued

2-FT. LEVEL, $25

Whether you are leveling the feet of a washing machine or hanging a picture, you'll need a level. The 24-in. size is inexpensive and versatile.



25-FT. TAPE MEASURE, $23

A 25-ft. tape measure is long enough for almost any job. Choose a tape that's durable and easy to read, with a wide, stiff blade that reaches out at least 10 ft. without flopping over.

CARPENTER'S SPEED SQUARE, $10

This simple square is designed to be held against a board while you mark 90° and 45° lines. But you can also slide your circular saw against it to make accurate cuts.



4- OR 6-IN-1 SCREWDRIVER, $6

When it comes to screwdrivers, a good value is a multi-bit model, which gives you a whole set in one tool. Double-ended bits store in the tool, and it can take the same bits you use in your cordless drills.

10-IN. PULLSAW ($20) OR 15-IN. CARPENTER'S SAW ($14)

These small saws are great for quick cuts, when you don't need a power saw. Traditional carpentry saws (top) are durable and easy to control. Japanese-style saws (bottom) cut on the pull stroke, making it easier to start a cut and avoid binding. They also make finer cuts.







10-IN. LOCKING PLIERS, $13

Locking pliers will grab and hold anything while you turn or pull it, such as nails or stripped bolts.

10-IN. GROOVE-JOINT PLIERS, $15

Groove-joint pliers open wide and are especially useful for plumbing jobs.

8-IN. SLIP-JOINT PLIERS, $7

These standard-issue, two-position pliers are good for everything from twisting wires to squeezing hooks closed to turning nuts and bolts in a pinch.

8-IN. LONG-NOSE PLIERS, $15

Also called needlenose pliers, this tool grabs smaller things more precisely, and fits where other pliers can't. The narrow jaws are also good for holding small nails and brads while you drive them, and are ideal for wiring jobs—it even includes a wire cutter.

8-IN. ADJUSTABLE WRENCH, $13

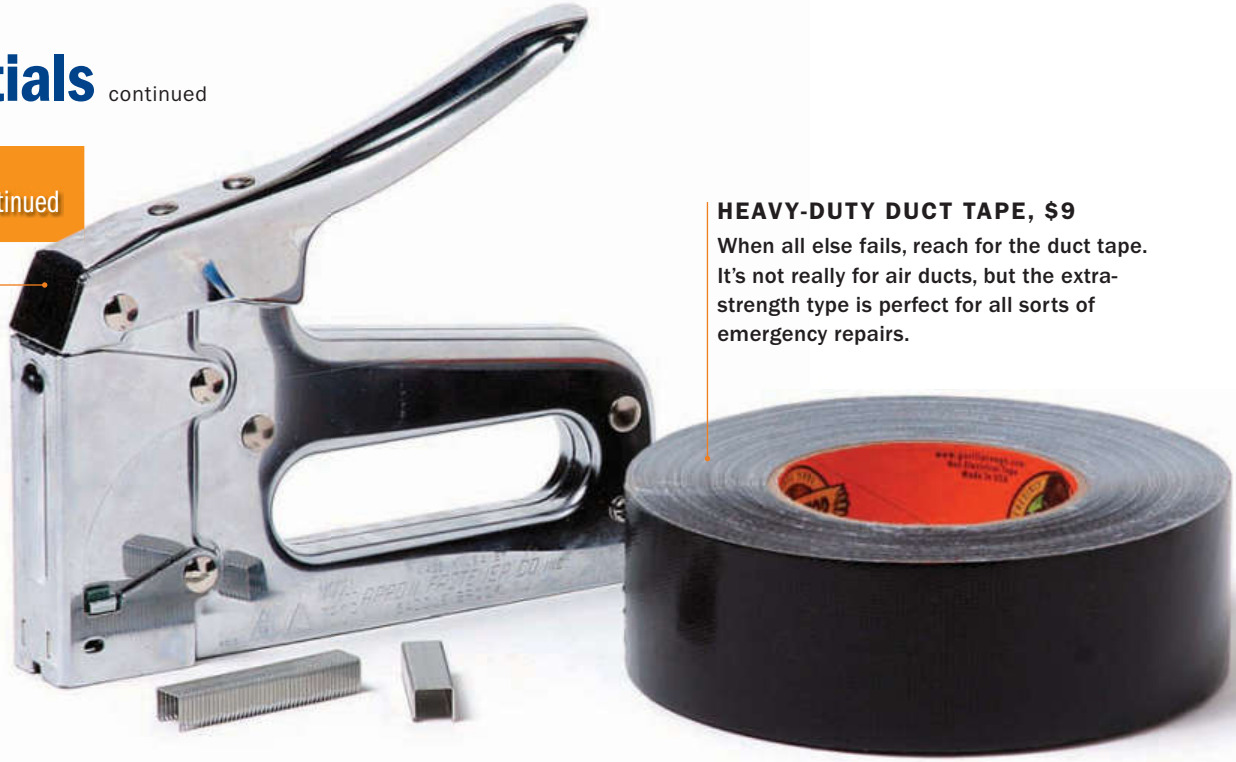
An adjustable wrench will grab almost anything and save you guessing "standard or metric" and rummaging for an exact fit, as you have to do with the wrench sets below.

SOCKET AND COMBINATION WRENCH SET, $100

For a positive grip and much more torque on tough nuts, you'll need a socket set and a set of combination wrenches, in both metric and standard sizes. We recommend a set that includes both ¼-in.- and ⅜-in.-drive sockets.

DIY Essentials continued

The core kit continued



HEAVY-DUTY T50 STAPLER, $18

A T50-size stapler is a construction tool with a host of uses, from attaching insulation and screens to tacking a red flag onto the end of a long board for the trip home from the lumberyard. Get one that is easy to open up and load, and make sure you can squeeze the handle—some are pretty stiff.

HEAVY-DUTY DUCT TAPE, $9

When all else fails, reach for the duct tape. It's not really for air ducts, but the extra-strength type is perfect for all sorts of emergency repairs.



STUD FINDER, $30

To hang things from walls, such as shelves and cabinets, you need to know where the studs are. A stud finder is the answer. Better-quality models will find both wood and metal studs through both drywall and the plaster-and-lath you'll find in older homes. They will also detect live wires (to be avoided).

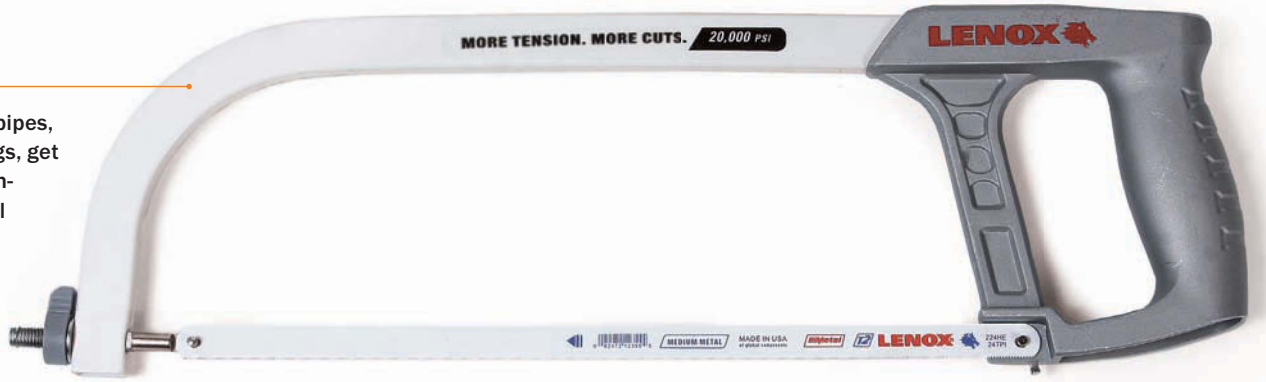


6 FT. FIBERGLASS STEP LADDER, $70

You might think you can get by with a step stool with just a couple of steps on it, but go for a stepladder. As you climb up to change a smoke detector or light fixture, the ladder gives you something to steady yourself against. We recommend fiberglass. Metal ladders can be dangerous when you are doing electrical work.

HACKSAW, $17

For cutting off bolts, pipes, and other metal things, get a hacksaw. A medium- or high-tension model will cut straighter and cleaner than a cheaper saw.



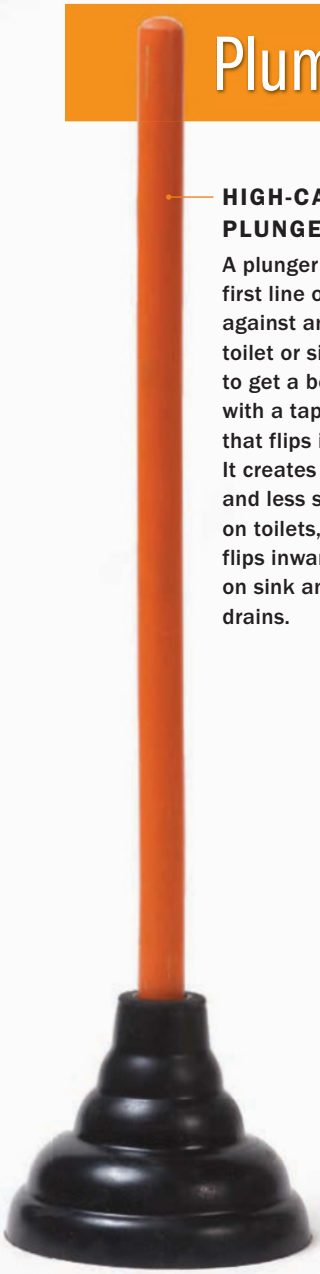


8-IN. FILE WITH HANDLE, $8

To clean up the rough, dangerous edges on those metal cuts, get a general-purpose file. It should have a double-cut pattern on one side for rough work, and a single cut on the other for smoothing.

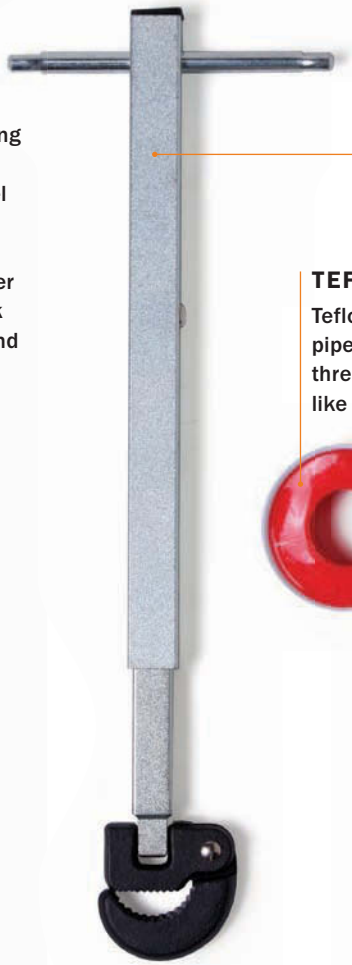
Plumbing tools

You already have screwdrivers, pliers, and wrenches that will work well on plumbing jobs, but you'll need a few specialists, too. With the following in hand, you'll be able to handle emergencies, repairs, and fixture installations.



HIGH-CAPACITY PLUNGER, $7

A plunger is your first line of defense against an overflowing toilet or sink. It pays to get a better model with a tapered end that flips in and out. It creates more power and less splash-back on toilets, and the end flips inward to work on sink and shower drains.



TELESCOPING BASIN WRENCH, $23

This tool does just one thing, but without it, you'll have a harder time changing a faucet. This long wrench reaches into the tight space behind a sink to release the nuts that hold the faucet in place and make the water connections.

TEFLON TAPE, $1.50

Teflon tape wraps around threaded pipe to create a water seal. You can get thread sealant in a tube, too, but we like the tape better.



DRAIN AUGER, $8

When the plunger won't work, you'll need a drain auger (snake). The snake will bore into any stubborn clog and clear it, saving you a call to the plumber.

Tools for electrical work

Like plumbing jobs, many electrical tasks can be handled with your core tool kit, but once again, you need some specialists.



NON-CONTACT VOLTAGE TESTER, $24

A non-contact voltage tester detects the presence of voltage without touching any wire. It's invaluable for finding live wires. Moving the tester close enough to any hot wire will make it light up. You can also use this tool to check cords and holiday lights for damage.

ELECTRICAL TAPE, $3

Electrical tape is great for cord repairs. It will come in handy for many other electrical tasks, too, like covering exposed wire in a splice made with a wire nut.





VOLTAGE TESTER, $4

Use a voltage tester to confirm that you have the breaker turned off for the circuit you are working on. That is a life-and-death issue. The simplest type has a pair of leads you stick into an outlet or touch to white and black wires to see if they're live. Advanced models will also tell you if you wired the outlet backwards.



WIRE NUTS, $2

Wire nuts join wires, such as when adding a dimmer switch or upgrading a light fixture. A variety pack will have the yellow and red sizes you'll use most.

WIRE-STRIPPING PLIERS, $20

An inexpensive set of wire-stripping pliers is ideal for stripping the ends of wires for splices and connections. Better models include a screw cutter, which trims screws that poke too far into electrical fixtures.



A few tools for painting

You'll save a stack of cash by doing your own paint jobs. Here's a collection of tools that will help you do the job right.



ROLLER FRAMES, ROLLER PAN, $14

To apply paint quickly and evenly to walls, you'll need a 9-in. roller frame (buy roller covers to suit the job) and a roller pan. We also recommend a 4-in. roller for narrow, flat areas on trim and doors.



PUTTY KNIFE, $5

You'll use this tool for scraping off dried paint and filling nail holes with putty. For the latter task, go for a flexible blade.



PAINTER'S 5-IN-1 TOOL, $6

This also has a scraper, with a stiffer blade for heavier work, but it does a lot more. It opens paint cans, lets you scrape excess paint off rollers and back into the can, and when wrapped with a rag is the perfect tool for cleaning up wet paint on glass and other surfaces not meant to be painted.



2-IN. ANGLED SASH BRUSH, $12

For all of the edges, corners, and moldings, you'll need a good brush. Don't treat it as a throwaway item. Buy the best brush you can for what you are brushing (oil-based or acrylic paint). It will hold more paint, give smoother results, and last for years with proper cleaning. The good news is that a 2-in.-wide angled "sash" brush is probably all you need.

DRIPLESS CAULK GUN, $3

For sealing against air and water, you'll be using a tube of caulk. To deliver it cleanly and accurately, get a caulk gun. But be sure your gun has a flip-out wire for puncturing a fresh tube, and a cutter for widening the tip.

Essential power tools

Power tools speed up your work and strip away tedium, but they can be dangerous to ears, eyes, and lungs. So we've included very essential safety gear.



DRILL AND DRIVER BITS, $10

Get a small set of drill and driver bits. Make sure it includes some long driver bits that will work in an impact driver, with Phillips, flat, and square-drive tips. A few nut drivers are nice, too.

CORDLESS DRILL/IMPACT DRIVER KIT, $110-$170

Many people keep a cordless drill on hand, and they use it for both drilling and driving screws. A more economical option is to buy a 12-volt drill/driver kit. With it, you get the standard drill, but you also get the power of an impact driver, which has a vibrating action that makes the biggest screws melt into the hardest wood. An impact driver will also drill holes of all sizes. With this kit, you can have one tool set up for drilling and the other ready to drive. The drill chuck will take all your old round-shanked drill bits, while the impact driver takes only hex-shanks.



6½- OR 7¼-IN. CIRCULAR SAW, $80-$100

You can't do everything with a handsaw—well, you can, but you might be there all day. A lighter, more compact 6¼-in. circular saw is big enough to cut up 2x lumber or a sheet of plywood quickly. A model with a 7¼-in. blade will be able to cut slightly thicker boards.



5-IN. RANDOM-ORBIT SANDER, $50-$110

A random-orbit sander with hook-and-loop disks can be used to remove loose paint and smooth rough wood. Spend a bit more here to get faster, smoother sanding action.

30-DB EARMUFFS, $25

Ear damage is cumulative and irreversible, and the loud bang of a hammer can be as bad as the roar of a circular saw. The most convenient and effective form of protection is simple earmuffs. We recommend a 30-decibel noise-reduction rating.





N95-RATED DUST MASK, 2-PACK, $7

Wood dust is a carcinogen. For sanding and sawing, you'll need a good dust mask. Spend a little more for the thicker, multilayered type rated N95 or better, with a vent so your glasses don't fog. You can use these many times over.



SAFETY GLASSES, $6

Eye damage is instant and devastating, and even if you wear glasses already, safety glasses are a must. They fit your head closely, and they are rated for very high impact.





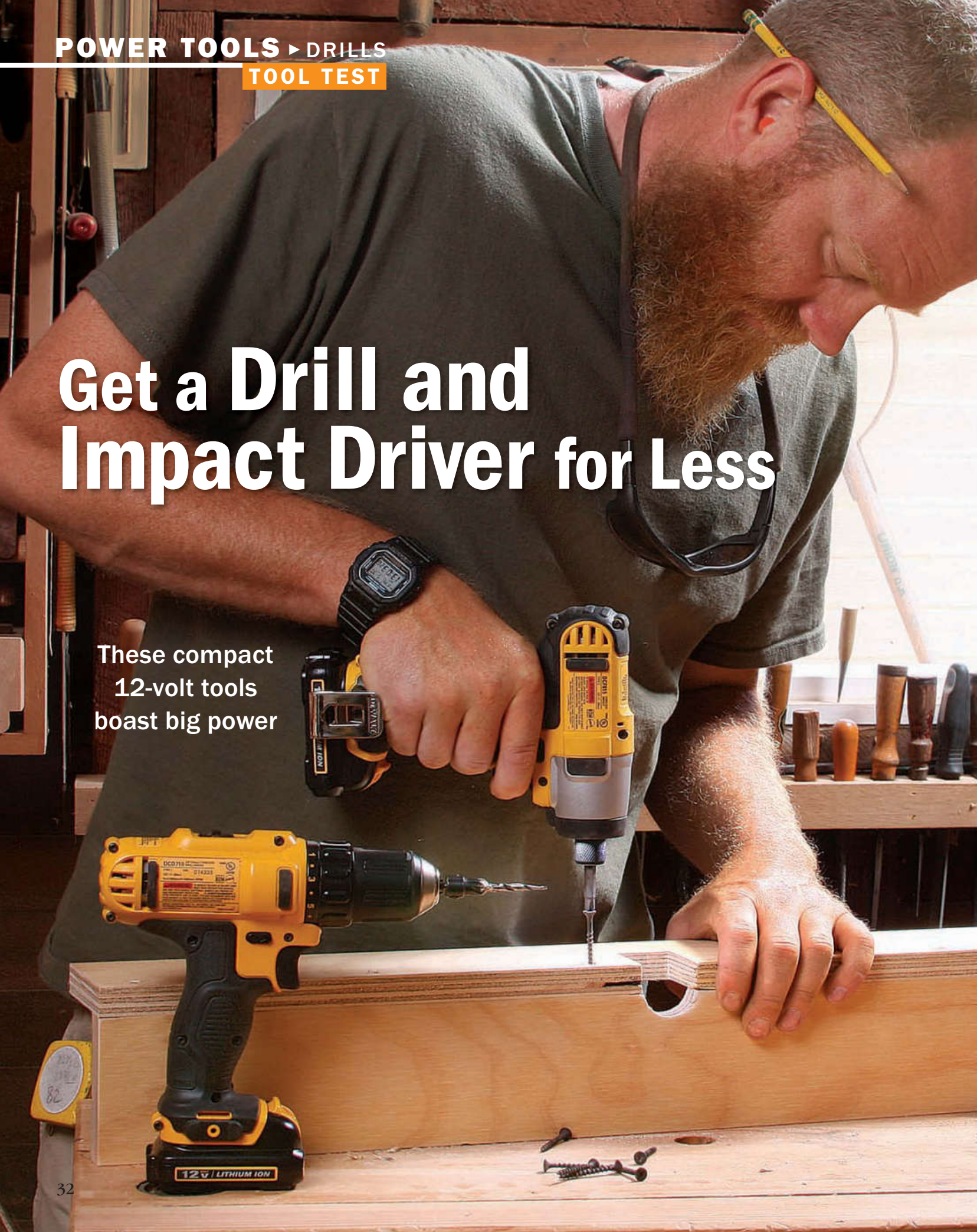


6-AMP JIGSAW, $60-$80

Your circular saw and handsaw will only make straight cuts. When reality throws you a curve, you'll need a jigsaw. Look for around 6 amps of power. By the way, you can put a metal-cutting blade in a jigsaw, too, turning it into a fast-action hacksaw.

Get a Drill and Impact Driver for Less

These compact 12-volt tools boast big power



Cordless technology has changed significantly in the past few years. With the combination of lithium-ion batteries and impact action, smaller 12-volt cordless tools are capable of performing tasks that required 14.4- or even 18-volt models 10 years ago.

There are many tools that fit this 12-volt category, but we focused on the two that are most valuable in a woodshop or on the job site, an impact driver and a standard drill, available as a kit with two batteries and a charger. Having both tools close at hand, one set up to drill holes and the other to drive fasteners, is a real advantage.

The batteries in this test are marketed as 12-volt, which is what they produce with a fresh charge and the drill spinning freely, but all produce 10.8 volts in actual use. As you'll see, these compact workhorses boast a lot of power. And at prices between $110 and $190 (with one big exception), these two-tool kits are the best buy in cordless.



User-friendly features

As with any tools, performance is about more than power. Conveniences make a big difference.

Easy bit changes. *The chucks on our favorite impact drivers allow bits to simply slip in (left) without a sleeve being pulled out. The chucks on our favorite drills lock when the trigger is released, letting you tighten them with one hand (below).*



Impact driver is the star

The impact driver is an amazing invention. When the going gets tough, it applies a series of rotational blows to the drive shaft, creating a vibrating action that makes screws almost melt into the wood. They require almost no pressure to stay engaged, and are very easy on the hands and wrists.



Light in the darkness. *The Bosch and DeWalt drivers have three LED work lights on the extreme end of the tool. The others have single LEDs, which can be blocked by the user's hand.*

Photos: staff

How the kits stacked up



MILWAUKEE FUEL 2594-22

Street price: $260

Batteries: (1) 2 amp-hours, (1) 4 amp-hours

With high-tech brushless motors, bigger batteries, and a higher price tag, Milwaukee's "Fuel" system doesn't quite fit the mix. But the batteries are rated at 10.8 volts, so we kept them in the test. The larger of the batteries adds power and run-time. The drill has a larger-capacity, metal chuck (which locks for tightening) and a selector ring to switch between drilling and driving modes. The driver is the only one with two modes. It also has a handy, push-in chuck. Both tools have belt hooks and battery indicators.



BOSCH CLPK22-120

Street price: $170

Batteries: 2 amp-hours

The Bosch tools performed with the best of the more affordable kits yet are the smallest of the lot. The impact driver is especially tiny, allowing it to fit easily in a tool belt or shop apron. The driver also has three LEDs and a battery indicator. The drill sports a locking chuck. The only drawbacks to the Bosch tools are the fatter handles that come with stick-style batteries, and a chuck on the driver that requires you to slide a sleeve forward to change bits.



DEWALT DCK211S2

Street price: $150

Batteries: 1.1 amp-hours

The DeWalt tools also tested at or near the top (behind the Fuel), and we enjoyed using them around the shop and on the job. The pod-style batteries allow thinner handles, which are more comfortable. This comes at the cost of being bulkier overall than the Bosch, though not by much. The drill has a locking chuck, and the impact driver is quite compact, features three LED lights, and has a slip-in chuck. The DeWalt tools also have the most user-friendly belt hooks.

READERS' RATINGS: DRILL/DRIVER KITS

Readers and editors chose the Milwaukee Fuel 2594-22 as their favorites. The Makita came in second among readers.

4.66	MILWAUKEE FUEL 2594-22
4.51	MAKITA LCT209W
4.49	BOSCH CLPK22-120
4.48	MILWAUKEE M12 2494-22
4.46	DEWALT DCK211S2
4.25	HITACHI KC10DFL
4.20	PORTER-CABLE PCL212IDC-2

The only disadvantage of an impact driver is the noise: Ear protection is a must.

While the drills all have a standard chuck and will use any type of bit you own, the impact drivers accept only ¼-in. hex-shanked bits. You probably already have some drill and driver bits like this, but if not, they are affordable enough.

Notes on the drills—The standard drills in these kits have a ⅜-in. chuck, except the Fuel, which will take shanks up to ½ in. dia.

We like drills with a chuck that locks when you release the trigger, letting you ratchet the chuck closed with one hand. All of the drills have a clutch, handy when you do happen to use them as a driver, and all have a variable speed trigger controlled with a switch on top that determines the maximum rpm. For example, the DeWalt drill will run from 0 to 400 rpm on low, and 0 to 1,500 rpm on high.

Tough tests

To test these kits, we developed a range of tasks that would push the tools as far as a typical user would, and beyond. All the tests were performed with freshly charged batteries. To get an overall feel for each tool, we also took them to job sites and used them to bore hundreds of pilot holes, drive boxes of screws, and perform any other tasks that came along in the work of a finish carpenter and cabinet maker.

We developed different tests for the drills and the impact drivers. First, we compared the power and endurance of the drills. We chucked a ⅜-in.-dia. brad-point bit into each drill and bored as many holes as pos-



HITACHI KC10DFL

Street price: $125

Batteries: 1.5 amp-hours

The Hitachi tools were middle-of-the-road performers. We found the chuck on the drill to be rough on the hands, and it was the only one that required two hands to tighten. The tools have the same slim, comfortable handle as the DeWalts, but the batteries are bulkier.



MAKITA LCT209W

Street price: $110

Batteries: 1.3 amp-hours

The Makita tools' appeal lies in their compact design, second only to the Bosch. They slip easily into a tool belt, and the drill has a locking chuck. The tools also have a battery-level indicator.



MILWAUKEE M12 2494-22

Street price: $170

Batteries: 1.5 amp-hours

Identical to the Bosch and DeWalt in performance and features, the Milwaukee M12 tools missed out on a Best Value pick because of their added size and weight, and the single LED on the driver. Like its big brother (Fuel), the M12 drill has a metal chuck, an industrial feature that promises more durability.

sible through a piece of 2-in.-thick hard maple. Milwaukee's Fuel drill blew everyone away here, with the DeWalt coming in second.

Next, we drilled as many holes as we could all the way through a hard, massive, old-growth fir beam, using a ¾-in. Irwin Speedbor auger bit. We like this test because the lead screw on the bit pulls it into the work, helping to ensure that all the drills are pushed in the same way. Again the Milwaukee Fuel was the winner by far, with the DeWalt, the Bosch, and the other Milwaukee drill leading the rest of the pack.

Finally, we drove some #4 brass wood screws into a piece of hardwood (with pilot holes) to test the range and sensitivity of each drill's clutch settings. All of the drills performed well in this test: It was easy to find a "just-right" number to countersink the screws correctly without stripping them.

Then we moved on to the impact drivers, using the same old-growth fir beams, driving as many 3-in.-long, Torx-head screws as possible on a single charge, with no pilot hole. This should be a brutal test for a 10.8-volt tool, but all of the impact drivers were great here. We repeated this test a second time and averaged the results. The Milwaukee Fuel impact driver was an arm-wrecking beast again, driving almost four times as many screws as the Bosch, which came in second.

Last, we attempted to drive 4-in.-long screws into undersize pilot holes in very dense, tropical hardwood. This was too much to ask of these drivers, but all managed to drive the screws at least partially.

Plenty of winners

Milwaukee's Fuel kit ran away with the Best Overall award. At a much lower price than the Fuel, our Best Value picks, the DeWalt and Bosch kits, are the best choice for most woodworkers. And just behind the Bosch and DeWalt was the other Milwaukee, just as powerful in all of the tests, but edged out for being larger and heavier. □

Kit Camp, a cabinetmaker and finish carpenter in San Diego, contributed to this article.



PORTER-CABLE PCL212IDC-2

Street price: $130

Batteries: 1.3 amp-hours

The Porter-Cable tools are compact and fully featured: The drill has a locking chuck, and both tools have a belt hook and a small magnet to hold a spare driver bit. Unfortunately, they tested near the bottom and the driver vibrated excessively, making it hard to keep the bit engaged.

TOOL TEST

Impact Drivers

Greater speed and power help these tools beat out standard cordless drills







It's easy to see why this tool has become so popular: The simple percussive action of an impact driver translates into more torque than you can get with the rotational power of a cordless drill. This means that the bit, be it a driver bit or a drill bit, does its job with more speed and more power.

Early impact drivers were mostly workhorses meant to provide exactly that, but many of today's models have been designed to provide more finesse. The balance of these traits is where the purchasing decision gets complicated, because it's completely dependent on how you use the tool. This variation in the performance traits of impact drivers sets the stage for this three-person review by *Fine Homebuilding* tool expert Justin Fink, and contributors Paul Johnson and Brian McCarthy (above, from left). After all, what better way to assess the needs of a wide audience of buyers than to compare the feedback of three testers?

This is a big category of tools, so we narrowed it based on a few criteria. First, we chose to focus only on 18-volt lithium-ion (Li-ion) cordless models. A variation on that subcategory is offered by the DeWalt and Porter-Cable tools, both under the same parent company, which are listed as "20v Max." Another comes from Panasonic, whose tool is also compatible with the company's 14-volt Li-ion platform.

Despite the industry's slow transition toward brushless motors, we chose to focus this review on tools with conventional brushed motors, with one exception: a brushless Panasonic driver. Feedback from our readers and information from other sources indicated that Panasonic, though lesser known, is a worthwhile contender in the impact-driver category.



Many, but not all, of these tools are available with either a compact battery (typically 1.5 amp hours, or Ah) or a larger battery (typically 3.0 Ah). Amp-hour ratings identify only the run-time of the tool between charges, not the power output.

READERS' RATINGS: IMPACT DRIVERS

The Makita driver was the readers' favorite, while the reviewers' choices, the DeWalt and Panasonic, were in the middle of the pack.

4.42	MAKITA LXDT04	4.33	BOSCH 25618
4.37	MILWAUKEE 2650-22	4.24	DEWALT DCF885M2
4.34	PANASONIC EY75A1LS2G	4.08	PORTER-CABLE PCCK640LB

Reviewer photos: courtesy of the reviewers; all other photos: staff

DeWALT DCF885M2

with 1.5-Ah battery: $200 **with 3.0-Ah battery:** $260

FINK This tool was my hands-down favorite. It has plenty of power and excellent slow-speed control, and I hardly ever stopped to swap batteries. I found the thin grip to be the most comfortable of the group, and the trio of LED lights mounted around the chuck really floods the work area with light. The battery-release button, similar to that on the Makita models, is simple and effective. My only quibble is that some of the extraneous rubber bumpers on the tool have started to peel off.

JOHNSON The DeWalt is a no-nonsense solid performer on every level. It has enough versatility to let you drive 3-in. screws one after another, then switch to attaching finicky cabinet-door hardware without sacrificing control. The area in front of the chuck is illuminated from all sides, eliminating the shadows that are created by the lights on all of the other drivers. Moreover, the LEDs stay lit for 10 seconds after the trigger is released, which is handy for working in dark spaces. Aside from producing a bit of a "clacky" sound when impacting, this is a smooth-operating driver, is fairly quiet, and has a comfortable grip.

McCARTHY This tool hit the sweet spot for me: It has lots of power, yet the sensitive trigger means that the tool always feels under control. The chuck is large enough to be operated with gloved hands and also allows for easy one-handed bit insertion. The batteries have push-button charge indicators, the belt hook is adequate, and the LEDs do a great job of putting the light just where you need it, and in ample quantity. This driver didn't do any one thing better than the others, but it was the one tool that seemed to do everything well.



BOTTOM LINE
With a near-perfect balance of power and finesse, this driver sets a high bar.

PANASONIC EY75A1LS2G

with 1.5-Ah battery: n/a **with 4.2-Ah battery:** $470

FINK This driver has the most seamless body design of the tools tested. With hardly a raised seam in the housing or bump when transitioning to the rubber grip, the Panasonic makes me think of the fuselage of a jet. This was the only model in this test with a brushless motor and a selectable speed setting. I didn't like Panasonic's design for the LED light: Not only does its location make it fairly ineffective, but the push button needed to turn it on and off just about guaranteed that I'll never bother with it.

JOHNSON Even though I found a few things to be quirky with the Panasonic driver, it was a pretty solid winner for me. Combining the finesse of the Bosch and Makita drivers with the power of the Milwaukee, it never slowed down. A button controls three levels of torque, from low to high, to protect more-delicate fasteners and work surfaces; however, the tool is so responsive that I hardly ever bothered changing the setting. Despite having the largest battery of the bunch, the tool itself was comfortable to use for long periods of time.

McCARTHY The battery on this tool felt large and boxy (4.2 Ah compared to the more common 3.0 Ah in this category), and it was a bit cumbersome to attach at first. Once I got used to lining up a pair of arrows on the battery and the tool, I found that no other tool allowed for faster, smoother battery changes. The belt hook is nice and wide and is set at a convenient angle, making for easy "no look" grabs. Selectable power levels set this tool apart from the others, and its overall trigger sensitivity and control were excellent. My only annoyance with this tool was the separate on/off switch for the worklight.



BOTTOM LINE
Priced to compete with other high-end selectable-speed brushless models, the Panasonic offers a good balance of guts and responsiveness, all wrapped up in a sleek, comfy design.

MAKITA LXDT04

with 1.5-Ah battery: $200 **with 3.0-Ah battery:** $260

FINK The percussive noise from this lightweight compact tool seemed easier on my ears than the noise produced by the other tools. As an odd contrast to that, though, the motor on the driver I tested had an unpleasant whine and a lack of power when operated at slow speeds. I found the release buttons on Makita's battery packs to be among the easiest to operate quickly. Although it's not a fault of the driver itself, Makita's fan-cooled charger was noisy and made the whole room smell like plastic.

JOHNSON With good balance and the smallest body of the bunch, the Makita quickly became one of my favorites. Even though it tied for the longest time required to sink a ½-in. lag screw into a glued, laminated (glulam) beam, it still had more than enough power for most tasks. It had plenty of finesse for driving small hardware screws and starting larger screws in high-torque situations, even without a soft-start feature. I have no complaints about the batteries themselves, but the charger was a bit loud. Also, many users may find its various signals and musical tones to be obnoxious.

McCARTHY My crew already has three Makita impact drive so I obviously think they are g tools. Still, I tried to assess this driver as if it were new to me, I continue to think it stacks rig up there with the best of them. The body length is short, maki feel compact and efficient, an power seemed to be consister the middle of the pack. I reali though, that it lacks the sensit trigger control found on the D and Hitachi drivers. If surplus storage is your thing, then you'll love the grossly oversize case that comes with this tool, whic designed to accommodate Ma 18-volt drill-driver as well.



BOTTOM LINE
Compact without sacrificing function, this model is a rock-solid value.

MILWAUKEE 2650-22

with 1.5-Ah battery: $150 **with 3.0-Ah battery:** $280

FINK This tool is built like a brick and inspires confidence in terms of long-term durability. It has lots of raw driving power and no shortage of torque, but at times—especially at the slow speeds required for delicate work—it felt difficult to control. I found the stubby chuck collar on this driver to be among the most difficult to operate, and those with smaller hands might have trouble with the fairly thick handle. The smooth, tubular-metal belt hook was far and away the best of any impact driver.

JOHNSON This tool is a speed demon that often left the nearest competitor several seconds behind in the timed screw-driving test. I found this driver just too powerful for some tasks, though, and I cammed out the heads of more screws with the Milwaukee than with any other driver. I also was surprised to find that I wasn't able to sink the ½-in. lag screws fully in my torque testing. This tool also has the biggest body of the bunch and felt the heaviest after extended use. For amenities, it has a nice, bright LED light, a charge display on its batteries, and a case that seems indestructible.

McCARTHY The case that comes with this tool is ideal: It's big enough to hold the tool and some accessories without requiring an engineering schematic, but small enough to be tucked away in a corner of the truck. Compared to the batteries of the other drivers, the larger of the two Milwaukee batteries is pretty boxy. This tool appeared to have the most power of the group, making short work of everything I could throw at it, but the trade-off was very little control at the trigger. While I'd gladly lend it to the excavator to pull some lug nuts, I'd keep it as far away from delicate hardware as possible.



BOTTOM LINE
This tool offers a hefty dose of speed and power, but if you're prone to cam outs, look elsewhere.

BOSCH 25618

with 1.5-Ah battery: n/a **with 3.0-Ah battery:** $270

FINK The one word I'd use to describe this tool is smooth. The trigger control, hum of the motor, and grip comfort were all superb. It did feel a bit large and clumsy to me, however, perhaps because of its upward-angled body. Also, it would seem that the interbrand competition to create the impact driver with the shortest body length left this tool with a nasty side effect: a chuck collar that's too short to grab comfortably.

JOHNSON I've used Bosch impact drivers for years and always thought they were the best, so I was surprised to find that this tool was only average in heavy-duty testing and for driving long wood screws. Under less strenuous use, however, I still found using the Bosch to be a pleasure. It was comparatively quiet and comfortable enough for all-day use, and its soft-start feature was the best of the bunch in preventing cam outs when working in difficult positions. Although Bosch tools have slowly been transitioning to include batteries with charge indicators, this model doesn't include them.

McCARTHY On the small side, this lightweight driver was comfortable to work with. Excellent control of the tool at the trigger made it a versatile unit capable of wearing multiple hats. Battery packs are sleek in design and attach easily to the tool without much thought. The downsides are a smallish hook that I often had trouble attaching to my belt, and the small chuck, which wasn't very glove-friendly. This tool came in a case that hit the sweet spot for me: room for some peripherals, but not too large.



BOTTOM LINE
All about finesse, this driver is a good choice for those with heavy trigger fingers.

PORTER-CABLE PCCK640LB

with 1.5-Ah battery: $170 **with 3.0-Ah battery:** n/a

FINK I typically don't get wrapped up in the appearance of tools, but I thought the Porter-Cable looked cool right from the first glance. I was worried that all the over-molded rubber on the grip would be uncomfortable after a long day of use, but it never bothered me in the least. In terms of features, I found the battery gauge simple and effective, but the belt hook a bit too small and the battery release too stiff. Trigger control wasn't the best, but the pair of magnetic, sidewinder-style bit mounts should become the standard for every drill-driver and impact driver.

JOHNSON The knobby, industrial styling of this driver made me think of a tool built out of Lego blocks; unfortunately, it was almost as uncomfortable. The segmented rubber grips didn't add any comfort to the already wide handle, and the forward/reverse lever is situated in such a way that it pressed against my finger while in use. In most tests, this tool's performance was average, although it tied with the Panasonic for being able to fully drive a 6-in. lag screw into a glulam beam in just 20 seconds. I also liked the one-handed bit changes and the two magnetic bit holders.

McCARTHY The case for this tool appears to be well built and rugged, but it's tiny. If you expect to keep a set of bits in the case, you will not be pleased. The tool itself was very popular with my crew. It has plenty of power for running large fasteners and excellent control at the trigger for delicate work. The chuck is large enough to lend itself to easy bit changes with gloved hands, and I love that it allows for one-handed bit insertion. The tool is balanced well, making it feel lighter than it actually is. This is a comfortable tool to use and an all-around good performer.



BOTTOM LINE
From a best-value point of view, the Porter-Cable is a strong contender. The lack of a large-battery option, though, will mean more trips to the charger.



18-volt Cordless Circular Saws

Modern cordless saws cut fast and run for a long time

Years ago, cordless circular saws had weak cutting ability and short run-times. But with lithium-ion (Li-ion) technology, 4-amp-hour (Ah) batteries, and brushless motors, today's new saws are superior to their predecessors. We tested seven 6½-in. 18-volt models, looking only at saws that could cut through 2x stock at a 45° bevel. When possible, we ordered saw kits, but many of these saws are also sold as bare tools. This is important because most builders and many DIYers already have multiple 18-volt batteries for their other cordless tools, so a nice cordless saw doesn't have to be a huge investment.

The strengths of a cordless saw are fast setup and total mobility, especially where outlets can be hard to find. Climbing staging to trim a rafter tail becomes a quick task—and

Photo, this page: Patrick McCombe; product photos: Rodney Diaz.



with one less extension cord, it's also a safer one. And cordless saws weigh a pound or two less than comparable corded saws.

Doug Mahoney, a remodeler in Harvard, Mass., contributed to this article.



EDITORS' CHOICE BEST OVERALL

READERS' CHOICE

MILWAUKEE M18 FUEL 2730-22

PRICE: $400 with two 4-Ah batteries, a charger, and a duffel; also available with one battery (2730-21, $300) or as a bare tool (2730-20, $200)

WEIGHT: 8 lb. 9 oz.

MAX BEVEL: 50°

MAX DEPTH: 2 3/16 in.

RPM: 5,000

LIGHT: LED

10 CUTS THROUGH 2x12: 34 seconds (1st)

LINEAR FT. OF PLYWOOD: 159 (1st)

FEATURES This is the only saw in the test with a brushless motor, which apparently made all the difference. The M18 Fuel cut with the ease of a corded saw, and the battery held up for almost 40 cuts across ¾-in. plywood before finally running out. Features include a magnesium baseplate and blade guard for durability, LED lights that illuminate the cut line, and a well-designed rafter hook. It was one of the heaviest saws tested, but it's well balanced, and the handle is very comfortable with or without gloves. The saw can get closer to vertical surfaces because its brushless motor is more compact than a regular motor. The design makes the Fuel at least 1 in. narrower than most of the other saws.

FLAWS The narrow baseplate makes the saw a little less stable than the others, and the depth-of-cut gauge faces the handle, which makes it somewhat difficult to read. These are just minor quibbles, though; there's hardly anything to complain about with this saw.

BOTTOM LINE If you're looking for corded power in a cordless saw, this is the one to get. Its good ergonomics, stellar run-time, and terrific cutting performance make it the Best Overall.



EDITORS' CHOICE BEST VALUE

DEWALT DCS391P1

PRICE: $260 with one 5-Ah battery, a charger, and a case; also available as a bare tool (DCS391B, $111)

WEIGHT: 8 lb. 5 oz.

MAX BEVEL: 50°

MAX DEPTH: 2¼ in.

RPM: 5,250

LIGHT: None

10 CUTS THROUGH 2x12: 42 seconds (2nd)

LINEAR FT. OF PLYWOOD: 142 (3rd)

FEATURES The DeWalt is an excellent combination of comfort and power. It's not the lightest saw tested, but because of its perfect balance, it felt like it. In addition, its fast-spinning motor produces very little vibration, which leads to smoother cuts.

FLAWS The only ergonomic oversight is that the handle rides on the top of the saw rather than behind it, so when the saw is set to make shallow cuts, the tool is more difficult to push. Also, the indicator line on the depth-of-cut gauge is small and tough to see, and the location of the battery-fuel gauge requires flipping the tool over to read it.

BOTTOM LINE The DeWalt has ample power and sports-car handling, and it's the most comfortable saw we tested. It also costs $40 less than the single-battery Milwaukee Fuel kit.

How we tested

To get a sense of how the tools would perform, we ran tests for power and run-time. To gauge the overall strength of each saw, we timed 10 crosscuts through a 2x12. To level the playing field, we equipped each saw with a new 6½-in. Irwin Marathon 20-tooth blade ($14) before testing. To test run-time, we charged all of the batteries fully, used each saw to cut 1-in. strips from a sheet of ¾-in. plywood, and totaled the amount of linear feet cut before the battery went dead. We ran both tests twice and used the better of the two numbers to rank the seven saws.

In addition to the structured tests, we used the saws on job sites and in the shop for cutting everything from lauan plywood to PVC trim. Most of the time was spent making ripcuts and crosscuts in all kinds of dimensional lumber. While doing this, we paid close attention to ergonomics, ease of adjustments, and the success or failure of all the other features.

READERS' RATINGS: CORDLESS CIRCULAR SAWS

Readers and editors agree that the Milwaukee M18 Fuel 2730-22 is the standout in the bunch.

4.54	MILWAUKEE M18 FUEL 2730-22
4.30	MILWAUKEE M18 2630-22
4.23	MAKITA XSS01
4.06	BOSCH CCS180
4.03	DEWALT DCF391P1
3.89	HITACHI C18DSLP4
3.80	PORTER-CABLE PCC660B

BOSCH CCS180

Price: $150 with case; a 4-Ah battery with charger sells for $100

Weight: 8 lb. 5 oz.

Max bevel: 50°

Max depth: 2 in.

RPM: 3,900

Light: None

10 cuts through 2x12: 48 seconds (4th)

Linear ft. of plywood: 147 (2nd)

FEATURES The Bosch is a big saw with big cutting power. The motor is smooth and produced the least amount of vibration when compared to the rest of the saws. Its large baseplate gives the tool great stability. The depth-of-cut gauge is easy to read and allows you to adjust the depth without having to twist and turn the tool to see the setting.

FLAWS Although the Bosch is not the heaviest in the group, it feels heavy because it is unbalanced and the ergonomics are poor. On the more comfortable saws, the handle gets thinner at the bottom, but the Bosch's gets thicker, making it awkward to grip, especially while wearing gloves. The safety switch is tricky to use because it's a button that you have to press into the tool and not a paddle that you press down. This saw does not have a battery-fuel gauge.

BOTTOM LINE This is a quality saw, but it's big and bulky compared to the rest. The poor design of the handle and safety switch makes the tool frustrating to use.





FEATURES The Hitachi is comfortable to hold and comes with a rip fence. Because it's so light, it's easy to use for extended periods of time.

FLAWS We found a number of red flags in the durability department. The metal baseplate is very thin, and the rail for the depth-of-cut ıtment sits behind the blade, lnerable to damage. While all of the other tools use a hex wrench for changing out the blade, the Hitachi uses a T-handle nut driver that's too big for on-board storage.

BOTTOM LINE This saw ranked last ıe power test and next-to-last in n-time test, and it suffers further k overall construction.

HITACHI C18DSLP4

Price: $130 (bare tool), tested with a 3-Ah battery ($72) and a charger ($40)

Weight: 7 lb. 10 oz.

Max bevel: 50°

Max depth: 2¼ in.

RPM: 3,400

Light: Incandescent

10 cuts through 2x12: 90 seconds (8th)

Linear ft. of plywood: 75 (7th)

MAKITA XSS01

Price: $340 with two 3-Ah batteries, a charger, and a case; also available as a bare tool ($165)

Weight: 7 lb. 12 oz.

Max bevel: 50°

Max depth: 2¼ in.

RPM: 3,700

Light: LED

10 cuts through 2x12: 66 seconds (5th)

Linear ft. of plywood: 71 (8th)

FEATURES The Makita is a solid little tool with a good feel. The bright LED lights up the cut line, and the handle is nearly as comfortable as the DeWalt's. We like the easy lever adjustments, and the connection between the body of the tool and the baseplate is nice and solid. The Makita fell toward the middle of the pack in power, but it didn't bind up while cutting the 2x12.

FLAWS This saw was at the bottom of our battery test, and it could use a better depth-of-cut gauge. In use, it has enough vibration to affect the quality of cuts.

BOTTOM LINE The high-quality look and feel of the Makita isn't enough to offset its last-place finish in the run-time test and fifth-place performance in the power test.





FEATURES We like how the baseplate of the M18 has straight and 45° kerf marks at the front and rear of the blade. It also has rulers along the side and front that are useful for quick repetitive cuts. It is the only saw where the locking lever for the depth-of-cut tightens on the upswing, so it won't get in the way of the baseplate even if it loosens over time. The M18 comes with a rip fence, and like the Fuel, it has a sturdy and lightweight aluminum blade guard.

FLAWS The M18 was the heaviest saw tested. Even with the nice handle and balanced weight, there's no denying that at more than 12 lbs. this is a heavy tool. We also expected the battery life to be better.

BOTTOM LINE There are a lot of nice features on this tool, but other saws have more power and stamina.

MILWAUKEE M18 2630-22

Price: $360 with two 3-Ah batteries, a charger, and a duffel; also available as a bare tool (2630-20, $119)

Weight: 9 lb. 3 oz.

Max bevel: 50°

Max depth: 2⅛ in.

RPM: 3,500

Light: None

10 cuts through 2x12: 44 seconds (3rd)

Linear ft. of plywood: 113 (5th)

PORTER-CABLE PCC660B

Price: $60 (bare tool), tested with a 4-Ah battery ($89) and a charger ($40)

Weight: 7 lb. 7 oz.

Max bevel: 50°

Max depth: 2⅛ in.

RPM: 4,000

Light: None

10 cuts through 2x12: 75 seconds (7th)

Linear ft. of plywood: 115 (4th)

FEATURES The Porter-Cable is a light little saw that could be used all day with hardly any wear and tear on the arm. One unique feature is that the depth-of-cut gauge is on the blade guard. This took some getting used to, but in the end, it was preferable to having the markings on the slide rail. The front kerf notch on the Porter-Cable is deep, allowing for easy cut alignment, but it's ⅛ in. off from the actual path of the blade.

FLAWS The locking lever for the depth-of-cut adjustment is poorly calibrated, so for cuts deeper than 1½ in., the lever extends below the baseplate. It's also not a very powerful saw and bound up often in the 2x12. It scored toward the bottom for battery life. The metal baseplate is thin, and the saw had the most vibration of those tested. Changing the blade is also difficult because there's very little clearance between the blade and the guard.

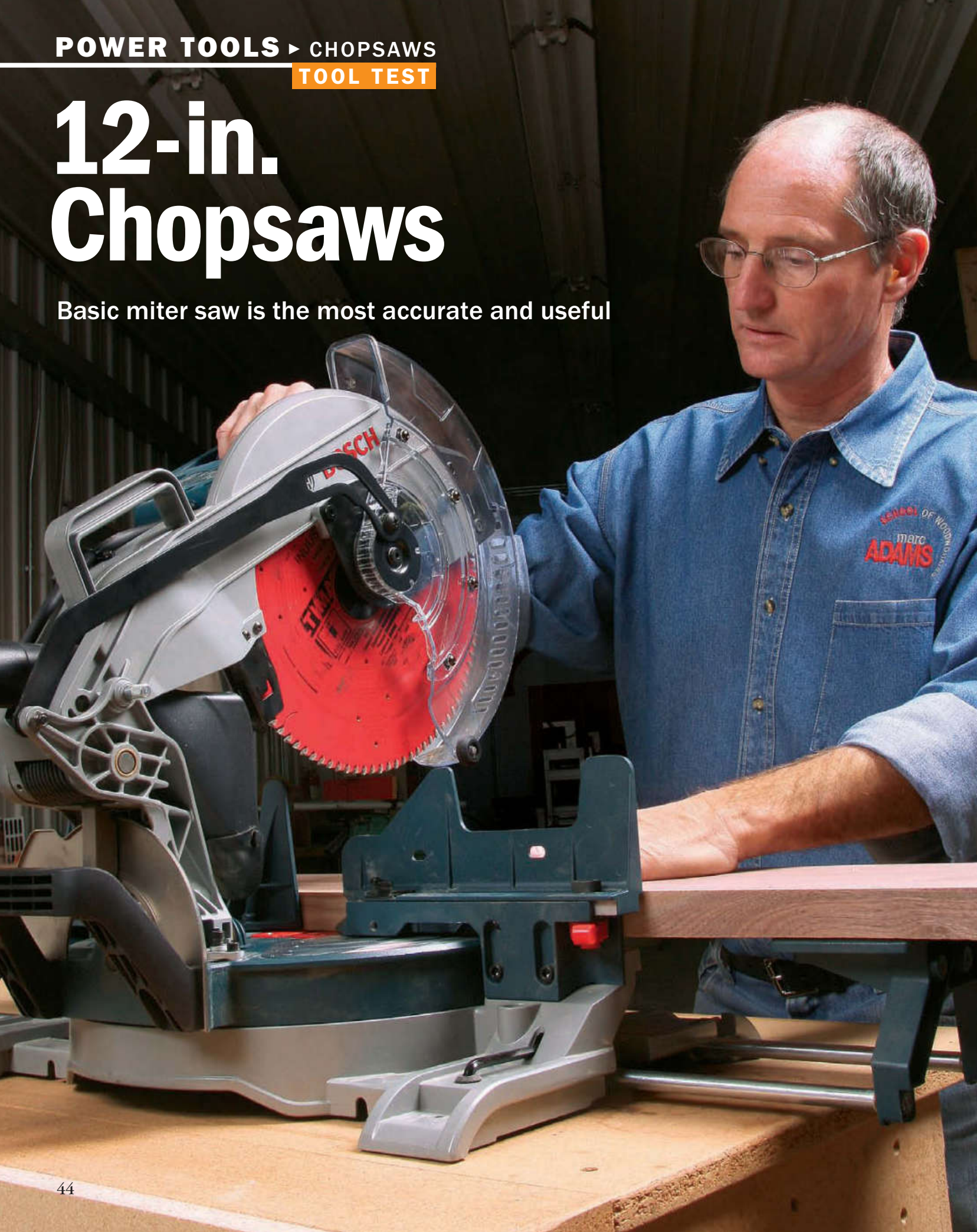
BOTTOM LINE Although the Porter-Cable is the least expensive saw tested, it's worth upgrading to a better performer.



TOOL TEST

12-in. Chopsaws

Basic miter saw is the most accurate and useful



When it comes to miter saws, a basic, no-frills chopsaw is the most accurate and useful model.

We recommend chopsaws that tilt in one direction only, since you can pivot the head sideways for angled cuts of all kinds, rather than tilting it. You won't get very clean, accurate cuts with the head leaning over sideways, probably because so much of the blade is engaged in the cut and it is hard to stop the workpiece from creeping sideways. Also, on most saws, a cut that is square to the board with the blade standing up straight suddenly won't be when you tilt the head sideways.

The current crop of saws was no different in this respect: None was able to make a smooth, extremely accurate bevel cut. Miter cuts, as always, were much better, if not perfect. We're also not fans of laser guides; in our experience, they don't work in every position.

On the other hand, it is well worth paying for the full 12-in. blade size vs. the 10-in. models. A 12-in. chopsaw has 30% more cutting capacity than its 10-in. counterpart in both width and thickness. These larger models also have more table area, for better workpiece support, as well as a taller and longer fence system.

In the end, just six saws filled the bill, all of them 12-in., non-sliding units that tilt in one direction only.

Tough cutting tests

We tested these saws, with woodworkers in mind because they require more accurate, clean cuts. We made our test cuts in hardwoods, milled square and true, and modern



BOSCH CM12

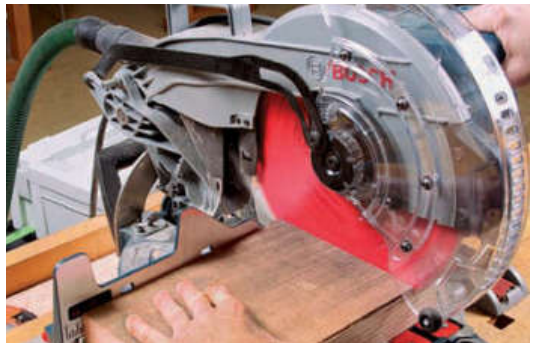
Street price: $330
Accuracy of cut: Excellent
Quality of cut: Excellent

EDITORS' BEST OVERALL CHOICE
READERS' CHOICE
EDITORS' BEST VALUE CHOICE

The first thing we noticed about the Bosch were deep milling marks on the table. These turn out to be a big benefit, gripping the wood to keep it firmly in place when cutting miters and bevels. With other saws, you have to maintain a tighter grip to keep workpieces from creeping. The stops and detents for common angle settings needed zero adjustment right out of the box. Also, the Bosch is the only model with a completely flat fence and table. Better yet, it produced the smoothest cuts, and flawless miter joints. Bosch got most of the little things right, too. The dust collection is the best of all the saws and the blade-braking system is smooth and fast. The blade is easy to change, and the guard stays out of the way on its own, the only one to do so. The only flawed feature was the graduated miter scale. The lines are thick and the pointer is imprecise. Also, when you set the pointer accurately at 90°, it is off a bit at 45°. The detents are accurate, though.



Easy adjustments. *Although the Bosch's stops arrived perfectly set, they are also the easiest to adjust, with a wrench that stows securely on board.*



Best dust collection. *The Bosch's tall, close-fitting dust port was the most effective on all types of cuts, keeping the floor pretty clean.*

Photos: Asa Christiana

composite materials like plywood and MDF.

The blades that come with most of the saws are thin, without enough teeth for smooth crosscutting. To level the playing field during the test, we replaced the stock blade on each miter saw with a higher-quality one.

We compared runout by making 90° cuts in all sizes and types of materials, checking for accuracy with a Starrett combination square, and adjusting the saw as needed. We also checked the flatness of the tables and fences. The Bosch stood out in both of these categories, while all the others had inconsistencies in one or the other.

After adjusting the saws in every way possible, our ultimate test for both cut quality and accuracy was making a mitered frame in wide material, and checking for gaps on every side of all four joints. Only the Bosch saw was able to make a flawless frame, though the Makita came very close.

Last, we checked the cutting capacity of each saw, using a 1-in.-thick board. Crosscut capacity was very similar, with each saw able to cut a board very close to 8 in. wide, or slightly wider. But capacity under the blade varied, which would come into play when standing boards up on edge against the fence to turn bevel cuts into miters. The Bosch and DeWalt saws stood out here, allowing nearly 7 in. under the blade, while the Makita (5½ in.) and Skil (5⅛ in.) saws fell a bit short.

Ease of use matters, too

With five saws set up in a row, it quickly became clear which of the models were the easiest to use. We noticed things like angle markings that are easy to read, and triggers that operate comfortably, even when you have to switch hands for certain cuts.

We didn't expect every stop and detent to be dead-on right out of the box, but we checked to see how easy it was to adjust them on each of the saws. We discovered that the miter detents are not adjustable on the Makita and Skil chopsaws—the fence adjusts instead, which we found less convenient.

Quality of cut also depends on having a zero-clearance insert in the saw's table. Because you will need to replace the insert from time to time, we made sure that each saw lets you install a shopmade insert. It's not too hard on any of them, but the job is easiest on the Makita.

We didn't factor in weight and portability, since we recommend bolting down your saw when using it in the shop. Because we also build table and fence extensions around our chopsaws, we didn't worry about the work supports that all but the DeWalt and Ridgid saws include on both sides of the table, though you might want to factor those in.

We tried the work holddowns that come with most of the saws, but all moved the stock away from the fence or



DeWALT DW715

Street price: $220

If you don't need your miter saw to make furniture-quality cuts, there is a lot to like about the DeWalt. The trigger works easily with either hand and doesn't have a second safety trigger, which is a slightly annoying issue with other saws. Changing the blade was easy and the blade guard has large view ports. Also, the table-locking handle is the easiest and most intuitive to use, with 11 detents for common miter settings, more than the other saws. But the cutting action was not as smooth as on the Bosch and Makita saws, and there was a little more runout, especially when cutting miters.



CRAFTSMAN 937564

Street price: $300

The Craftsman bevels in both directions. It is also surprisingly quiet. However, the handholds are too short, the miter lock is springy, and the detent override lever is so low that we scraped knuckles using it. Ergonomics aside, the most egregious problem was a poorly machined arbor that had the blade spinning almost 1/16 in. out of true. The poor machining also showed up as a grinding noise when adjusting the miter angle. Finally, the saw had the smallest vertical capacity of any saw tested. This saw needs better machining to be a serious contender.



HITACHI C12FDH

Street price: $250

Quiet and powerful, the Hitachi arrived with the fence, blade, and table perfectly straight and square right out of the box. Bevel settings are easy to adjust, and we were able to tweak miter angles to within one-tenth of a degree. This saw doesn't come with extension wings, but the table is 4½ in. tall, so a stack of three pieces of 2x material can act as a support. It's big and heavy and is the only saw with the bevel scale on the side of the saw arm, which makes it difficult to see. Dust collection was marginal with just the dust bag, but it improved when a vacuum was attached. This saw is a great choice for a shop.

MAKITA LS1221

Street price: $315

This is the most solidly built saw, with more metal parts and thicker castings than the others. It has very little runout, smooth cutting action, and a smooth and fast braking system. It delivers an excellent quality of cut. On the other hand, you must adjust the fence to adjust the miter detent angles, which is inconvenient, and the detents tend to drag the table toward them, making it hard to set up certain miter angles. But our main issue with this saw was that its table was the least flat, which affects cutting accuracy at times.

SKIL 3821-01

Street price: $220

This saw has too many problems for us to recommend it. The guard had to be removed completely to change the blade. Also, the arbor nut had been painted over, making it very difficult to remove. But the main problems are with precision and quality of cut. It is difficult to achieve an accurate miter, because the locking knob moves the table sideways when you tighten it. Also, there is considerable runout in the blade, which contributed to the inaccuracy of joinery cuts, and there is no brake.

off the table when tightened. And we also tried the laser guides included here and there, but none proved to be visible and/or accurate in all blade positions. That's fine, because it's easy enough to work to a pencil mark, and more accurate to use stops for repeat cuts.

Head-to-head results

All of these saws had enough power to cut the widest, thickest plank of hard maple that fits on the saw, but not all were able to produce furniture-quality cuts.

The Bosch CM12 stood clearly above the rest of the saws, making clean, precise cuts in the toughest woods. □

Woodworking teacher Marc Adams (marcadams.com) and his staffers Zane Powell and Doug Dale contributed to this article.

READERS' RATINGS: 12-IN. CHOPSAWS

Readers agreed with our editors, ranking the Bosch number one. But the Makita and DeWalt saws scored nearly as high.

★★★★½	4.29	BOSCH CM12
★★★★½	4.17	MAKITA LS1221
★★★★½	4.14	DEWALT DW715
★★★½	3.57	SKIL 3821-01
NOT SURVEYED		CRAFTSMAN 937564
NOT SURVEYED		HITACHI C12FDH

18-Gauge Brad Nailers

Now able to shoot 2-in. nails, these small tools are more versatile than ever

New carpenters used to be told to purchase a 15-ga. or 16-ga. model as their first finish nailer, but now that most 18-ga. models can shoot a 2-in. nail, the smaller and less-expensive brad nailer has become a great all-around choice for trim. Short of hanging doors or installing heavy trim, many carpenters use brad nailers for nearly every finish-carpentry task. Besides being versatile, 18-ga. nailers leave a much smaller hole than 15-ga. and 16-ga. nailers, which is better for stain-grade work and will have the painters that follow you singing your praises.

For this review, we focused on 12 tools that accept 2-in.-long nails. Using 2-in. nails is standard for a lot of common tasks, such as nailing the outer edges of casing, and fastening baseboard and crown molding. We tested these nailers by using them daily in ways a finish carpenter would. We loaded all the tools into a milk crate and pulled two or three out at the



Photo, this page: Andy Engel

CADEX 18.50

Price: $240
Weight: 3.4 lb.

Despite its awkward appearance, this tool was our favorite of the test. It operates smoothly and quietly, is relatively compact, and has a feature we love: a built-in air blower. The blower, which is on the front of the housing, is useful for clearing drywall dust and debris when installing base trim. It's also useful for dusting off tools and cleaning up at the end of the day. This nailer has a solid feel, and its performance was excellent. Its front safety, with a wraparound rubber nose, handled funky angles deftly. The only thing missing is a belt hook.

FEATURES air blower, dry-fire lockout, rear exhaust, quick-release nose, swivel air fitting





Let the air out. *The built-in blower on Cadex's brad nailer is handy for clearing drywall dust and sawdust from corners and trim. The flow is controlled by a metal trigger you push with your thumb.*

BOSTITCH BT1855

Price: $85
Weight: 2.6 lb.

This tool was a pleasant surprise. It left very small holes even in the hardest wood, demonstrated excellent power, and was able to shoot 2⅛-in. nails. It is also an oilless model, which many carpenters who work primarily with stain-grade materials prefer. Its very small front safety provided excellent visibility, but the tool was harder to get engaged at odd angles.

FEATURES dry-fire lockout, rear exhaust, belt hook with pencil sharpener, swivel air fitting





Better belt hook. *Bostitch's belt hook has a built-in pencil sharpener, and it holds the hex wrench used for clearing jams and making repairs. No tools are required for mounting the hook, which fits on either side of the nailer.*

MAKITA AF505

Price: $80
Weight: 3.2 lb.

This nailer feels and shoots like a $200 tool, but it costs just $84. Everything about it is refined: It has the smoothest magazine operation of any of the nailers, and it is quiet and comfortingly heavy. While it's very capable at odd angles, its chunky nose and lack of a dry-fire lockout kept it from being our favorite model. In addition, the removable safety can fall to the ground when you open the driver housing; it could easily disappear into a pile of shavings.

FEATURES directable exhaust, belt hook, quick-release nose





Red means stop. *The Makita doesn't have a dry-fire lockout, but it does have red indicators that show when the magazine is empty.*

Photos, except where noted: Rodney Diaz

beginning of each day, connecting them to a small trim compressor set at 100 psi.

We used these tools for jobs that are pretty typical for 18-ga. nailers: installing door and window casing, baseboard, and cabinet crown. We also tested them in the shop, firing rack after rack of 2-in. and 1⅝-in. nails into salvaged, old-growth fir offcuts. To test power, we fired 2-in. nails into blocks made from three layers of ¾-in. Baltic-birch plywood. All of the tools performed well. Interestingly, we didn't have a single jam during the entire testing period, which speaks well to the overall quality of this group of tools.

The 14 nailers we tested have a host of features that weren't common eight or 10 years ago. Many now have rear exhaust. Those that don't instead have rotating, top-mounted exhausts, so you can direct the blast of air away from your face and from accumulated drywall dust. Almost all of the nailers have a belt hook so that they can be hung from your tool belt or ladder when you need two hands to position the work. Many models also have a quick-release nose, which allows you to clear jams quickly without tools. All feature depth-of-drive adjustment to keep hole size to a minimum. We found that all of the depth-of-drive adjustments work pretty well, but some get smoother and easier to adjust with time.



READERS' CHOICE

GREX 1850GB

Price: $198
Weight: 3.0 lb.

The Green Buddy is heavy-duty and quiet. The only feature it's missing is a quick-release nose for clearing jams. It has a nice swivel air fitting and a cutaway at the back of the magazine that helps it fit into corners. This tool did make larger holes than some of the other nailers in the hardest of the test materials.

FEATURES dry-fire lockout, rear exhaust, belt hook, swivel air fitting

All of the tools performed well. We didn't have

All of these nailers feature side-loading magazines, split between composite-plastic and metal construction.

Some of these tools have the ability to go from single-shot firing to bounce firing. In single-shot (sequential-trip) mode, the tool fires one nail when the contact is depressed. To fire another, the contact must be released and depressed again, then the trigger pulled. This can be a pain when you're working in awkward spaces. This feature is designed to enhance safety, but a little convenience is a tradeoff.

Our favorite feature, found in many of the nicer tools, is a dry-fire lockout, which means that the nailer will not fire when the magazine is empty.

Generally, many carpenters have a preference for the position of the safety contact on their nailers. Some models have a plunger behind where the nail exits; others have it in front. Either way, your view is blocked half the time.

Neither the position of the safety nor the size of the nose affected the performance of these tools much in regular use. Only once, with the giant nose on the Makita, were we not able to place a nail where we wanted in an awkward corner. Removing the plastic no-mar tip solved that problem. We discovered that the larger, wraparound-style safeties like Makita's work better at odd angles.

With a couple of exceptions, we would be happy to use any of these nailers daily. If backed against a wall, we would choose the Cadex as Best Overall. Best Value is tougher, as most nailers are priced similarly. Again, if forced, we would choose the Bostitch or the Makita. □

Kit Camp, a finish carpenter in San Diego, contributed to this article.

READERS' RATINGS: 18-GA. BRAD NAILERS

Readers judged the Grex 1850GB as the best in the bunch, while the editors' choice, the Cadex, followed right behind.

4.59	GREX 1850GB	
4.33	CADEX 18.50	
4.33	UFFY 1825XP	
4.30	SENCO FINISHPRO 25XP	
4.21	RIDGID R213BNE	
4.19	DEWALT DWFP12231	
4.19	HITACHI NT50AE2	
4.19	PORTER-CABLE BN200C	
4.18	MAKITA AF505	
4.14	BOSTITCH BT1855	
4.04	MAX NF255F/18	
3.71	GRIP-RITE GRTBN200	



DeWALT DWFP12231

Price: $80 **Weight:** 2.6 lb.

DeWalt and Porter-Cable (below) are both owned by Stanley Black & Decker, so it should be no surprise that their 18-ga. nailers are nearly identical. The only difference is that the DeWalt model has rubber bumpers on the housing. Both nailers are light and oilless, and they have excellent depth adjustment and ample power.

FEATURES rear exhaust, belt hook, quick-release nose



GRIP-RITE GRTBN200

Price: $90 **Weight:** 3.0 lb.

Nearly identical in appearance to the Uffy model, the Grip-Rite has a smooth feel and is a solid performer. The rear safety with its large wraparound rubber tip worked well when nailing at funky angles. This tool also has a short magazine that allows good maneuverability.

FEATURES directable exhaust, belt hook, quick-release nose, swivel air fitting



HITACHI NT50AE2

Price: $60 **Weight:** 2.0 lb.

Simply put, this model didn't work very well. It's louder than any other tool, left the largest nail holes, and felt too light to be stable.

FEATURES directable exhaust, cutaway magazine, quick-release nose



MAX NF255F/18

Price: $110 **Weight:** 2.4 lb.

We really like this tool. The nail holes it left were among the smallest, and it fired extremely consistently in our tests. It also shoots 2⅛-in. nails. The tool had a different feel depending on which firing mode was selected. If it had dry-fire lockout and came with an air fitting, this tool would be nearly perfect.

FEATURES rear exhaust, belt hook, quick-release nose

a single jam during the entire testing period.



PORTER-CABLE BN200C

Price: $80 **Weight:** 2.4 lb.

This nailer and the DeWalt model are identical except that there are no rubber bumpers on the Porter-Cable's housing. Both are highly capable, with sensitive depth adjustments and excellent power. They are light and oilless, and they have a full range of modern features.

FEATURES rear exhaust, belt hook, quick-release nose



RIDGID R213BNE

Price: $98 **Weight:** 2.4 lb.

We've heard good buzz about Ridgid's brad nailer over the years, and it proved itself a top performer. It's quiet and it shoots nails up to 2⅛ in. long. Moreover, it has every feature found on a modern brad nailer. It has an oilless design, is lightweight, has plenty of power, and has a transparent magazine that allows you to see the nail supply.

FEATURES dry-fire lockout, rear exhaust, belt hook, quick-release nose, swivel air fitting



SENCO FINISHPRO 25XP

Price: $150 **Weight:** 2.6 lb.

Though not one of our favorites, the Senco nailer was a standout in the power category. It easily sank nails into the hardest test materials. Carpenters or woodworkers who routinely fire nails into thick, hard materials should take a close look at this tool. It does not have a belt hook or an air fitting.

FEATURES directable exhaust, oilless operation, 2⅛-in. capacity, 5-year warranty



UFFY 1825XP

Price: $180 **Weight:** 2.4 lb.

A relative newcomer to the retail market, Uffy has supplied industrial users for some time and claims that its nailers are made for industrial use. We found this tool to be a no-frills, capable performer. Externally, its look and features are very similar to those of the Grip-Rite. It performed well at odd angles, while shooting quietly and with little recoil.

FEATURES belt hook, rear exhaust, rear wraparound safety

Midsize Fixed-Base Routers

Great combination of power and control



Online Extra

For video tips on how to secure your work for routing, go to **FineWoodworking.com/TG2016.**

A midsize fixed-base router is an invaluable tool for woodworkers of every skill level. On its own or teamed up with shopmade jigs, this elegantly simple tool can drill, shape, size, plane, and cut wood similar to the way big stationary equipment can.

Rated between 11 and 15 amps, midsize models (larger than a trim router, which can be held in one hand, but smaller and lighter than a heavy, industrial 3¼-hp router) are plenty powerful for common tasks yet are still relatively compact.

We tested eight midsize fixed-base routers, rated between 1¾ and 2³⁄₁₀ hp, with electronic speed control, and including both ¼- and ½-in.-dia. collets, so you can use the full range of router bits. The speed ranges are similar, from 8,000 to 10,000 rpm up to 23,000 to 25,000 rpm.

Electronic motor control is a recent innovation, which helps the router maintain its rpm under load. It also allows soft start, which is a must-have. Without it a router goes instantly from 0 to 20,000-plus rpm, jumping in your hands. With soft start, the router comes up to speed gradually.

All of the routers will work in a router table, but the Bosch, Ridgid, Porter-Cable, and Milwaukee routers offer through-the-base depth adjustment for that purpose.

We evaluated the routers in 30 different ways, but boiled it all down to five ratings: cut quality, router accuracy, control and handling, bit changing, and visibility of cut.

Tough tests for cut quality

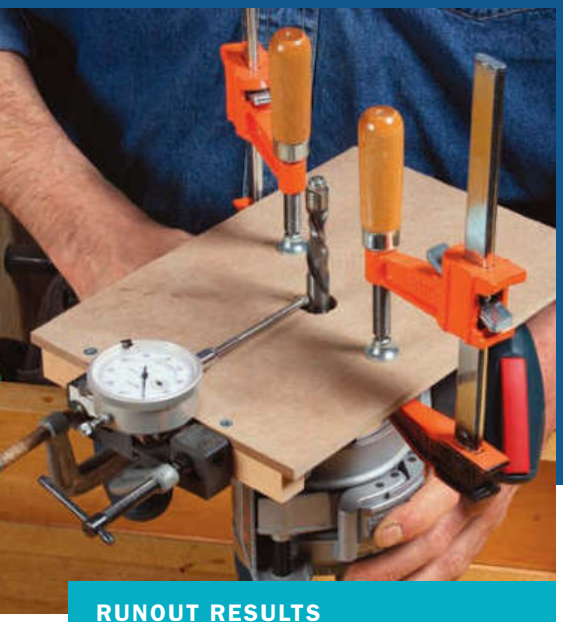
We started with the most important question: Can the router make smooth cuts in the toughest situations?

Our first test was for runout (wobble), which could come from either the motor

Photos: Asa Christiana

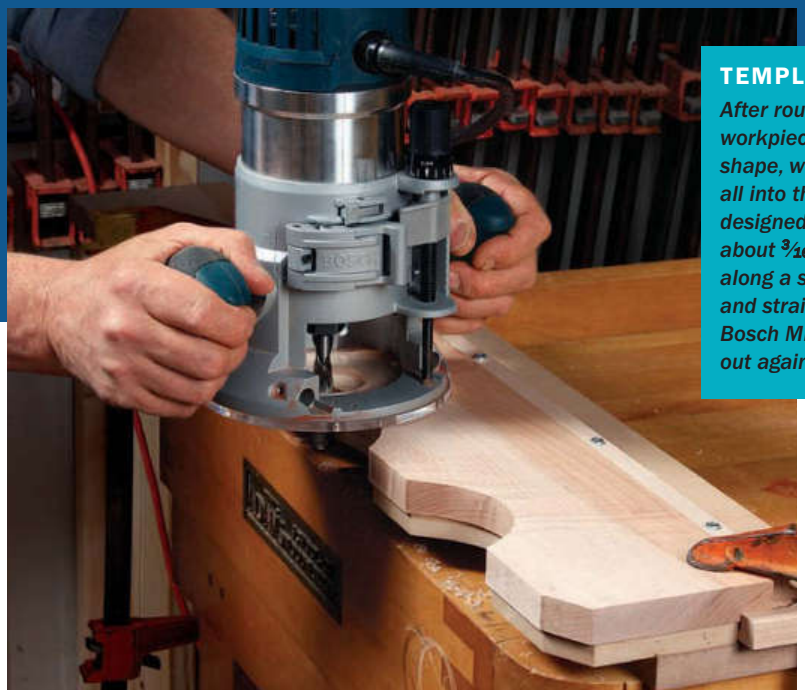
Performance tests

We used three tests to evaluate smoothness of cut. We also evaluated control and handling during two of them.



RUNOUT RESULTS

With a dial indicator touching the shank of a good router bit, we turned the collet by hand to check for wobble, or runout. The Bosch MRF23EVS had the least, just 0.001 in., but most of the others had less than 0.003 in., an acceptable amount.



TEMPLATE TEST

After roughing eight workpieces to the same shape, we loaded them all into this fixture, designed to remove about 3⁄16 in. of material along a series of curves and straight lines. The Bosch MRF23EVS stood out again.

or collet and create chatter and a bumpy cut. Initially we checked by hand.

To check for real-world runout, we did two cutting tests, on long grain and end grain, using ½-in.-shank bits.

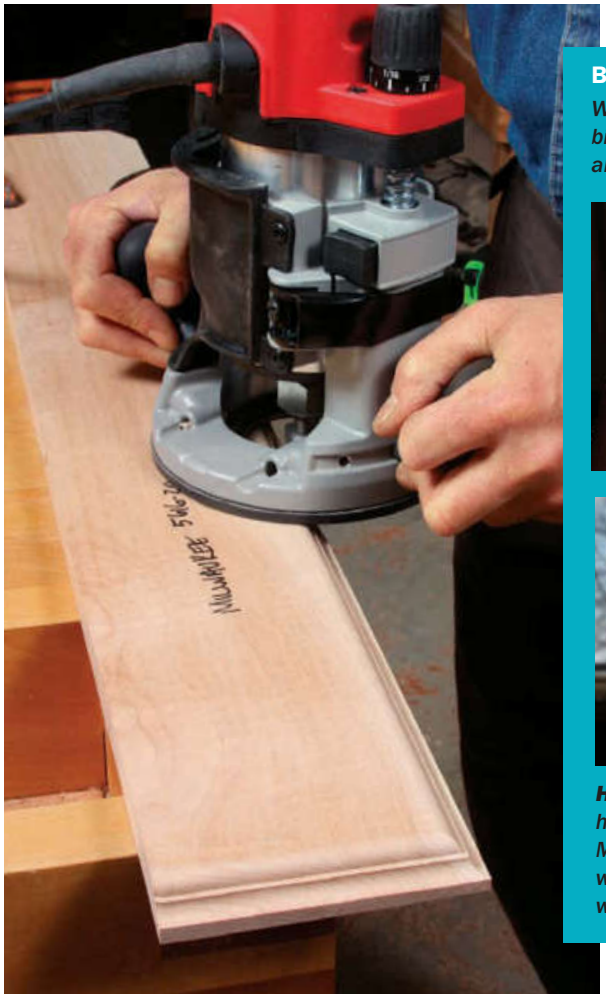
We also ran an up-spiral, bearing-guided, flush-trimming bit against a pattern, trimming 3⁄16 in. off the edge of a workpiece. All of the routers made smooth cuts in this test. The Milwaukee's cut was a standout.

The second test was tougher. We made a full-depth molding cut along the edges of a hard-maple workpiece, using a large, bearing-guided ogee bit. Even with this heavy cut, most of the routers were able to deliver a smooth cut without struggling.

We blended all of these tests into a single rating for cut quality.

Accuracy is important, too

A fixed-base router has only a couple of adjustments, the most important and frequent being the depth setting. Some routers employ a rack-and-pinion; on others you twist the base to move it up and down. Both systems allow fine, precise movements. All of the routers then lock the base with a cam device. All of the cam locks shifted the bases the tiniest bit, but not enough to worry about. We factored those tiny amounts into the accuracy rating, too.



BIG BITES

We used a new, high-quality router bit to make deep molding cuts along both long grain and end grain.





Harsh light. *A raking light showed how smooth the cuts were. The Milwaukee (top) cut the smoothest, while the Hitachi's sample (bottom) was one of the bumpier ones.*

How they stacked up



BOSCH MRF23EVS

Power: 15 amps

Street price: $220

This is the heaviest and most powerful router in the test. With rack-and-pinion adjustment, it has good balance and control, with shaped handles that fit the hand. It was one of the smoothest cutters. A built-in work light is always on when the tool is plugged in, which helps with setups. On the downside, the base was a little tricky to remove for bit changes and the on/off trigger in the handle was awkward to use for those with large hands.



MILWAUKEE 5616-20

Power: 13 amps

Street price: $200

This rack-and-pinion model made the smoothest cuts in our tests, and uses two hefty wrenches and collet nuts for the easiest bit changes. It is well-balanced and comes with a unique hand strap and rubber grip on the motor, which offers better control for some tasks. The control score was hurt a little by the Milwaukee's soft start, which was jumpier than some. The depth scale was inaccurate, but not everyone uses these.



DEWALT 618

Power: 12 amps

Street price: $150

This simple, twist-to-adjust router has a lot going for it. Its depth scale is accurate. It has a gentle soft start, made smooth cuts, and is a very well-balanced machine with a low center of gravity. The grips give excellent control and the switch can be set up for left- and right-handers. The single-wrench/spindle-lock system makes bit changing more cumbersome, and you may need to drill out the 1$^{3}/_{16}$-in. base opening to accommodate larger bits.



BOSCH 1617EVS

Power: 12 amps

Street price: $170

This router has a great soft start, is very well balanced, made very smooth cuts, and has an accurate micro-adjust scale on its rack-and-pinion depth system. It has two wrenches, and the base comes off easily for bit changes. On the other hand, the ball-shaped grips are slippery and the baseplate is black, which can hamper visibility.

All of them also have some sort of scale to keep track of the depth. Most of the scales were very accurate, but the Milwaukee was 0.025 in. off (almost $^{1}/_{32}$ in.).

When you run the baseplate of the router against a fence, the precision of the cut can be affected by how concentric the base is with the collet. While none turned out to be perfectly accurate, all but the Hitachi are easily adjustable.

Control affects safety and accuracy

We evaluated how easy it was to control the router in a variety of situations: when picking it up and turning it on, when turning it off and setting it down, and most importantly, while making cuts.

We also factored in the switch locations, and whether they can be reached without removing one hand from the handles.

Creature comforts

One thing you'll do often is change router bits. The easiest way is with two wrenches. Some tool designers have adopted single-wrench systems, which force you to hold down the router and a spindle-lock button with one hand while pulling hard with a single wrench. We favor routers that still use two wrenches: the two Bosches, the Hitachi, the Makita, and the Milwaukee.

READERS' RATINGS: FIXED-BASE ROUTERS

Readers judged the Bosch 1617EVS as the best of the bunch, with the editors' top choices close behind.

★★★★½	4.46	BOSCH 1617EVS
★★★★½	4.42	MILWAUKEE 5616-20
★★★★½	4.39	BOSCH MRF23EVS
★★★★½	4.33	PORTER-CABLE 892
★★★★½	4.32	DEWALT 618
★★★★½	4.20	HITACHI M12VC
★★★★½	4.20	MAKITA RF1101
★★★★½	4.15	RIDGID R22002

Although you can keep some of the bases on the router while changing the bit, it is much easier to do it with the bases off and out of the way. So we gave extra points to bases that are easy to remove.

Most routers come with transparent baseplates, an improvement over the old-school black ones. Large openings in the base also help. We factored all that into a visibility rating, and gave a bump to the routers with an effective work light.

Most were solid performers

In the end there was no one perfect router, and seven out of the eight are certainly usable tools. We would be quickest to buy the Bosch MRF23EVS or Milwaukee 5616-20, so those are our Best Overall choices. The DeWalt was our pick for Best Value, edging out the Ridgid solely on price. □

Marc Adams, Doug Dale, Mark Hedin, and Zane Powell contributed to this article.



HITACHI M12VC

Power: 11 amps

Street price: $120

This twist-to-adjust router was the quietest in the test, and is the lowest priced. Other than that it had the most pitfalls of the lot. The soft start was jerky, the motor had a lot of vibration, and the grips were slippery. We also struggled to remove the router base and to get the bit to release from the collet. Last, the baseplate was significantly off center, and its countersunk screw holes made it impossible to adjust. We can't recommend this router.



MAKITA RF1101

Power: 11 amps

Street price: $190

The Makita had very little runout and produced very smooth cuts. The twist-style base is very easy to attach and detach for bit changes, and the collet is tightened with two wrenches. However, the 1⅛-in. hole in the baseplate will need to be enlarged for bigger bits. Also, the router felt slightly top heavy, the grips were on the slippery side, and we had to let go of one handle to reach the on/off switch.



PORTER-CABLE 892

Power: 12 amps

Street price: $180

The Porter-Cable's soft start works well, and the scale on its rack-and-pinion micro-adjuster is very accurate. Its variable-speed dial is the only one to list actual rpm, making it the most accurate. The base is easy to remove for bit changing, but the single-wrench system makes bit changes a little awkward. Also, this router had the most bit runout.



RIDGID R22002

Power: 11 amps

Street price: $160

The rack-and-pinion-type base on the Ridgid was easy to remove, the micro-adjustment scale was the most accurate, and the grips offer good control. Also, it has a work light, its variable-speed dial lists actual rpm, and it comes with a handy cone for centering the base. However, with one wrench and a spindle lock, removing the bit was a little awkward. And while it made good cuts, the motor had more vibration than we would like.

MODEL	CUT QUALITY	ROUTER ACCURACY	CONTROL AND HANDLING	CUT VISIBILITY	EASE OF BIT CHANGES
READERS' CHOICE Bosch 1617EVS	Excellent	Very good	Good	Good	Good
EDITORS' BEST OVERALL CHOICE Bosch MRF23EVS	Excellent	Excellent	Very good	Excellent	Good
EDITORS' BEST VALUE CHOICE DeWalt 618	Very good	Very good	Very good	Very good	Fair
Hitachi M12VC	Good	Fair	Fair	Good	Fair
Makita RF1101	Excellent	Good	Fair	Good	Good
EDITORS' BEST OVERALL CHOICE Milwaukee 5616-20	Excellent	Good*	Very good	Very good	Excellent
Porter-Cable 892	Good	Excellent	Very good	Very good	Very good
Ridgid R22002	Very good	Very good	Very good	Very good	Fair

*Excellent if you don't rely on scale for depth adjustment

Shop Vacs

Only the best vacuums can handle both fine dust and heavy pickup

In the past several years, the lowly shop vacuum has transformed from the dull canister brought in to clean the floors after a day of work to an essential, often high-tech tool found on job sites and in shops. An increased understanding of the health benefits of keeping dust out of the air helped to spark this transformation. Nowadays, most tools are designed with dust ports to connect to vacuums, and adapters are commonplace for retrofitting older tools. Features such as tool activation and self-cleaning filters are becoming more common and have greatly increased the versatility of the traditional shop vac.

How we chose

There are a host of shop vacuums on the market, so rather than focusing on any specific size or feature, we reviewed vacuums that would work well for general job-site and shop use. Beyond that, we looked at cost, availability, capacity, features, and functionality.

All of these models can be fitted with HEPA filters if they don't already come with them, and all can be fitted with disposable filter bags. Likewise, all are on wheels and can be lifted or pulled around easily. The hoses range in length from 7 ft. all the way up to 16 ft.; the longer hoses are especially helpful when used with sanders or other tools that need a wide range of motion. All of the vacuums tested have power cords at least 15 ft. long, a welcome change from the standard short power cords of yesteryear.

We also considered availability and cost. There are several brands of worthy shop vacuums that could have been included in this review, but ordering the vacuums themselves, let alone finding parts or accessories, was often restricted to specialty shops and online outlets. Regarding cost: While there are some excellent vacuums on the market that cost over $1,000, we decided to stay under $700 or so—not an outrageous price for a well-made tool that is used nearly every day. □

Paul Johnson contributed to this article.



READERS' RATINGS: SHOP VACUUMS

Readers preferred the Festool to the editors' choices for this tool.

★★★★★	4.76	FESTOOL 583493
★★★★☆	4.09	MILWAUKEE 8936-20
★★★★☆	3.94	MAKITA VC4710
★★★★☆	3.88	DEWALT DWV012
★★★★☆	3.84	RIDGID WD1450
★★★½☆	3.61	SHOP VAC 975-16-11

Photos: Nina Johnson



EDITORS' BEST OVERALL CHOICE

MAKITA VC4710

Street price: $550 **Capacity:** 12 gal.
Weight: 27 lb. **Noise level:** 59 db.
EPA compliant: Yes **HEPA filter included:** Yes **FILTER CLEANING:** Yes

FEATURES This vac easily handled concrete, drywall mix, sawdust, and other debris during our tests. The self-cleaning action—which kicks on every 15 to 20 seconds—does a great job of keeping the filters clear and the suction strong. The front wheels are prone to snags, but this vac is light and easy to lift when necessary. It's also stable, despite its relatively tall, narrow shape. Filter bags were easy to remove, even when filled with 60 lb. of concrete. We appreciate that this vac came with a cuff adapter to connect tools and other accessories right out of the gate.

FLAWS We disliked the noise and operation of the filter-cleaning function. No matter what speed the vacuum is set at, it ramps back up to full speed for a number of seconds to reverse the airflow over the filters. Plus, the noise of the airflow sounds like a tennis ball being sucked up and whacked into the vacuum. That's a bit unnerving when you're using a tablesaw or other tool that requires focused attention. Also, the water-level sensor hangs down from the motor inside the body of the vacuum, and got caught every time we tried to put the top back on after emptying the container.

BOTTOM LINE This vac performed toward the top of all the tests and was versatile enough to be used in any situation. Its versatility and ease of use, along with its self-cleaning filter features, made it our choice for Best Overall.



EDITORS' BEST VALUE CHOICE

RIDGID WD1450

Street price: $100 **Capacity:** 14 gal.
Weight: 27 lb. **Noise level:** 90 db.
EPA compliant: No **HEPA filter included:** No **Filter cleaning:** No

FEATURES Primarily geared toward cleanup rather than connecting to tools, this vacuum includes wands and accessories but has no tool-activated mode. The vacuum powered through all the tests without losing much suction, but a few shakes were necessary to keep heavier debris from settling in the larger-diameter hose. The canister of the vac incorporates handholds to help with tipping and emptying the contents, a feature many other models lacked.

FLAWS Although pleasantly throaty, this vacuum can't be called quiet when compared to the other models tested. Its relatively short 7-ft. hose made it necessary to drag the vacuum around—not so easy considering that the small casters got caught up on even the smallest debris. Our tester also got static shocks from the hose, especially when collecting large quantities of material. The powerful exhaust on the vacuum is useful as a blower when needed, but otherwise, it's an annoying drawback when dust and loose materials are in the room. A warning: The first use after cleaning the filter on this vac will give you a burst of residual dust.

BOTTOM LINE This inexpensive tool held up surprisingly well against the more expensive vacuums tested. Fitted with a HEPA filter, it's a solid choice for all-around cleanup.



READERS' CHOICE

FESTOOL 583493

Street price: $700 **Capacity:** 9.5 gal.
Weight: 30 lb. **Noise level:** 71 db.
EPA compliant: Yes **HEPA filter included:** Yes **Filter cleaning:** No (available on non-HEPA model CT-36A)

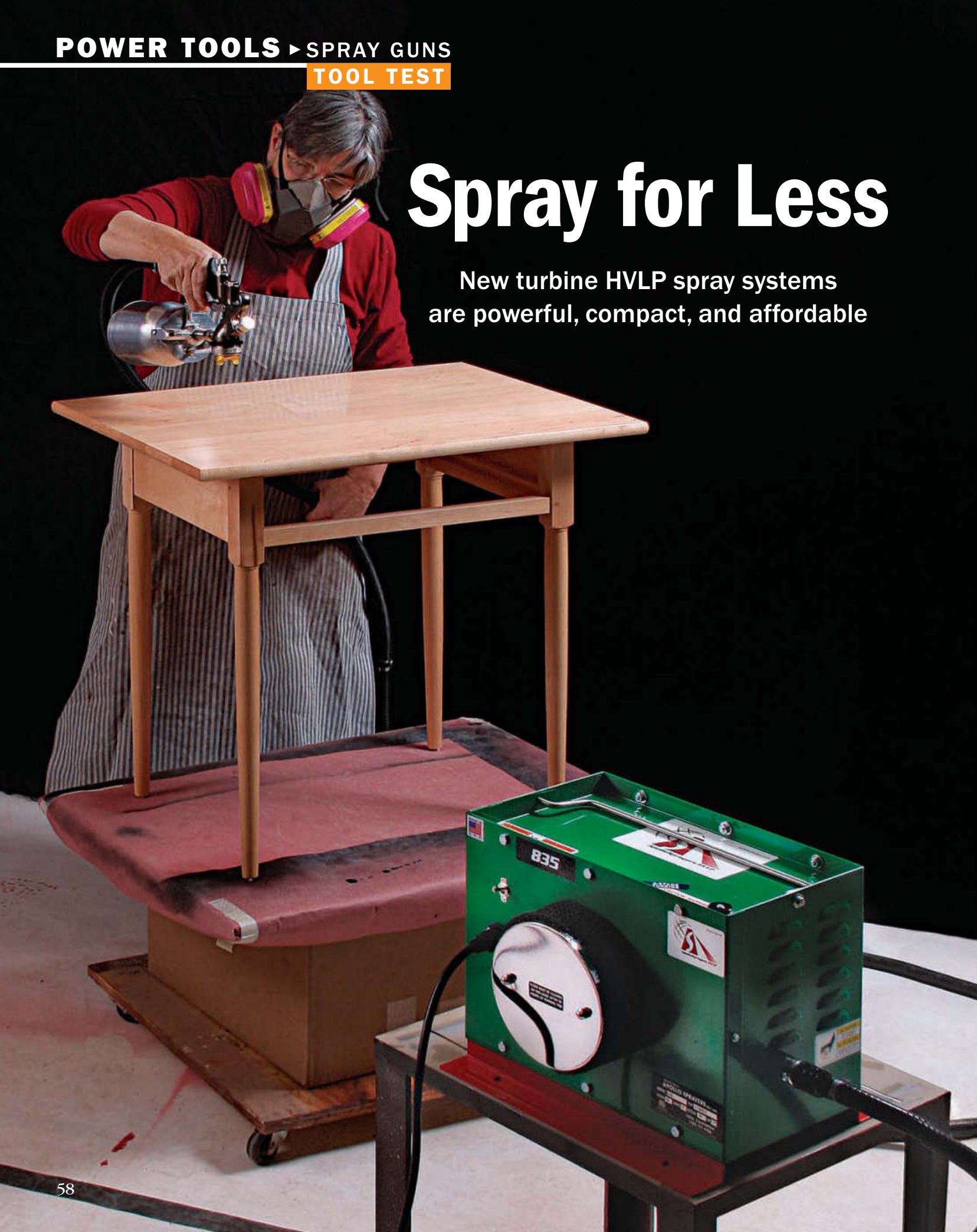
FEATURES The Festool is considered by some to be the ultimate shop vac. Its size and shape make it next to impossible to tip over, and its top is easily used as a work surface or for storage of tools and accessories. The large wheels roll over cords and job-site debris better than those on any of the other vacuums tested. With an optional filter bag installed, almost no dust ever reaches the main filter, and the vacuum can power through any task, either tool-activated or manual. The design includes a great cord wrap and hose storage.

FLAWS Unlike earlier versions of this vac, this model has no way to clean the filter without opening the whole unit and removing the filter to shake it out. When vacuuming a mix of fine and heavy debris, the debris helped to keep the filter unclogged by knocking against it. Unless you use a bag when collecting fine dust, though, the filter fills quickly and loses a lot of suction. The 1¼-in.-dia. hose seemed to get snagged more often than the hoses of the other vacuums tested, and it clogged when vacuuming planer shavings, nails, and other heavier debris. A larger hose is available and works well, but it costs an additional $150.

BOTTOM LINE If this vac didn't require a bag to maintain adequate suction, we would pick it as the top choice. Aside from that, the quality and functionality of this tool are without equal.

Spray for Less

New turbine HVLP spray systems are powerful, compact, and affordable



The top performers

If you're looking to create professional-quality finishes quickly, these four sprayers won't let you down. They all excelled in finish quality and comfort, and were the most intuitive to adjust.

FUJI SPRAY MINI-MITE 3

$620

The Fuji had a wider spray pattern than the others, and the pattern maintained a consistent shape, which was impressive. The non-bleeder-style gun has a very comfortable grip and features an easy-to-reach fan-width adjustment knob on the side. As the lowest-priced option of the three Best Overall winners, this system also gets a Best Value award.





APOLLO 835 TURBOSPRAY

$900

This system boasts plenty of power with high-quality components that did not disappoint. The grip on the non-bleeder-style gun is very comfortable, producing a soft, fine spray with an even pattern that was easy to adjust using a dedicated ring near the air cap on the front. The cup has a protective coating inside to prevent corrosion, a nice feature.



APOLLO ECO-3/E7000 GUN

$750

This system is a great performer, producing a fine mist with a nicely shaped spray pattern that's convenient to adjust using a knob on the back of the non-bleeder-style gun. The cone-shaped interior design of the cup is a unique feature that keeps the gun from spitting air when it gets low on material, a plus.



EARLEX SPRAYSTATION HV 5500

$300

Despite its low price, this gun does not compromise on comfort or spray quality. The cup has a protective coating inside to prevent corrosion, and the air cap adjusts with nice action. The air hose connects to the top of the bleeder-style gun, which cramps finger space for the fluid knob below, but the solid performance makes the gun an amazing value.

If you've considered a spray system for your shop, turbine-powered HVLP systems are the way to go. They take up almost no floor space when not in use and virtually eliminate setup compared with compressor-driven systems, providing professional results almost right out of the box.

We looked at 11 different HVLP spray systems, with stationary turbines that connect to the spray gun with a hose, to see if they deliver a professional-quality finish. The sprayers had to be compatible with both water and solvent-based lacquer.

The guns divide into two styles, "bleeders" that continue to spray air when the trigger is released and "non-bleeders" that stop spraying air when you release the trigger. Non-bleeders are nicer to use. You don't have to worry about where the gun is pointed when you're not spraying. We also evaluated the sprayers on the adjustability of the gun controls, ease of loading and cleaning, and handle comfort.

The proof is in the pattern

The first evaluation was the spray test. A spray gun must produce a fine mist with a symmetrical or slightly tapered fan-shaped pattern in a nice straight line.

To test each sprayer's ability to break finish into a really fine mist, we sprayed black-tinted

Photos: Ben Blackmar

The bottom line: How well do they spray?

Masaschi tested each system by spraying dark-colored solvent-based and water-based lacquer onto white cardboard, making it easy to see the size of the spray droplets and the shape of the spray pattern.

water-based and solvent-based lacquer onto white cardboard.

Comfort and simplicity are key

When you're holding something for an hour or more, comfort can be a very big deal. There are many good designs among the sprayers tested. We tested the gun handles for both small and large hands, and then averaged the scores, but the scores were consistent between the two.

Finally, to test the adjustability of each sprayer, we focused on ease of adjustment, intuitive design, smooth action, and convenient placement of the knobs that doesn't interfere with other gun features. □

Teri Masaschi contributed to this article.

READERS' RATINGS: HVLP SPRAY SYSTEMS

Readers and editors both liked the Fuji Spray Mini-Mite 3 the best.

4.49	FUJI SPRAY MINI-MITE 3
4.43	3M 23K-PRO 1
4.42	APOLLO ECO-3/ E7000 GUN
4.33	LEX-AIRE LX-60C
4.25	EARLEX SPRAYSTATION HV 5500
4.22	APOLLO 835 TURBOSPRAY
4.21	GRACO FINISHPRO 7.0
4.21	TITAN CAPSPRAY 75
4.12	EARLEX SPRAYPORT HV 6003
3.69	WAGNER FLEXIO 890
3.58	ROCKLER HVLP SPRAY SYSTEM



3M 23K-PRO 1



EARLEX SPRAYPORT HV 6003



GRACO FINISHPRO 7.0



LEX-AIRE LX-60C



ROCKLER HVLP SPRAY SYSTEM



TITAN CAPSPRAY 75



WAGNER FLEXIO 890

MODEL	STREET PRICE	EASE OF ADJUSTMENT	SPRAY QUALITY	COMMENTS
Apollo 835 Turbospray	$900	Excellent	Excellent	Tested with the A7500 QT non-bleeder-style gun that's comfortable to hold, and easy to use and adjust.
Apollo ECO-3/ E7000 gun	$750	Excellent	Excellent	Non-bleeder-style gun is comfortable to use and simple to adjust. System produces a nice spray pattern.
Earlex SprayPort HV 6003	$550	Excellent	Excellent	Air and fluid knobs located on the back of a non-bleeder-style gun, making it easy to dial in a nice spray pattern. The system had plenty of power, but the gun was not as comfortable as several others.
Earlex SprayStation HV 5500	$300	Good	Very good	Great performance with a comfortable bleeder-style gun and simple controls.
Fuji Spray Mini-Mite 3	$620	Excellent	Excellent	Gun has a comfortable handle and a dedicated spray-width adjustment knob. The spray pattern was consistent and impressive.
Graco FinishPro 7.0	$950	Good	Good	This gun worked well, but sprays fast and heavy, making it better suited to professionals covering large areas. The non-bleeder-style gun has a comfortable handle and the system packs nicely into the carrying-case-style turbine.
Lex-Aire LX-60C	$900	Fair	Very good	Air volume and spray pattern on this bleeder-style gun are both controlled by adjusting the air cap, which was stiff and difficult to turn.
Rockler HVLP Spray System	$147	Poor	Poor	Cup mounts with threads, making it difficult to clean. The gun handle is uncomfortable, and the bleeder-style gun could not be adjusted to spray a fine mist. Hose attaches to top of the gun, and often got in the way.
3M 23K-Pro 1	$1,200	Very good	Very good	This non-bleeder-style gun worked well and was comfortable to hold. But it uses a cup system with disposable liners that added inconvenient steps to the process.
Titan Capspray 75	$960	Poor	Good	This non-bleeder-style gun produced a nice spray pattern but sprays fast and heavy, making it better suited to professionals covering large areas. Gun was not very comfortable, with overly complicated adjustments.
Wagner Flexio 890	$190	Poor	Poor	Convenient on/off switch on the body. Produced a nice spray pattern, but not a very fine spray. There is no hook to hang the spray gun from, and the hose is permanently connected to the gun, so it tips over easily.

Ultra-Portable Tablesaws



BOSCH GTS1031

Saw weight: 52 lb.

Stand weight: 14 lb.

Table size: 22 in. wide by 20 in. deep

Price: $350; GTA500 folding stand sold separately, $80

We were intrigued when Bosch introduced a smaller jobsite tablesaw, model GTS1031, with an 18-in. rip capacity. In an ad for the saw, an average-size carpenter is shown carrying it with one hand while climbing a staircase.

Not long after Bosch introduced this compact saw, DeWalt introduced its own. DeWalt now has an entire line of ultra-portables. For this test, we considered three, which are similar but have different rip capacities—the DW745 (20 in.), the DWE7490X (28½ in.), and the DWE7491RS (32½ in.). We decided to put the DWE7490X up against the Bosch in a head-to-head test.

First impressions

Both saws come almost fully assembled, and their out-of-the-box accuracy was similar. We spent about half an hour on each saw making the blade parallel to the miter slot and setting the stop for 45° bevels. The process for truing the blade is the same for both saws. It involves loosening four machine screws that hold the trunnion to the table and then aligning the blade to the miter slot with a combination square.

Guards and controls

Each saw has a well-designed, three-part modular blade guard that includes a riving knife, anti-kickback pawls, and a blade cover. The blade cover and anti-kickback pawls are removable, and they can be stored on the saw's housing. The riving knives, which are the thickness of thin-kerf blades, rise and tilt to match the blade height and bevel. The DeWalt includes two riving knives: one that accepts the blade cover, and a finlike one for use with-

Photos: Rodney Diaz

SMALL enough to carry with one hand, but BIG enough for job-site work



DeWalt 7490X

Saw weight: 57 lb.

Stand weight: 16 lb.

Table size: 26 in. wide by 22 in. deep

Price: $499, packaged with folding stand

out the cover. Both DeWalt knives can be swapped or removed altogether by pulling a cable-connected handle that is mounted under the saw table. This setup is easier to use than the Bosch's, in which a small lever secures the riving knife. Although the height of the Bosch's knife is adjustable, the knife itself can't be removed readily.

Both saws have blades that are fully enclosed under the table. When connected to a good shop vacuum via their 2½-in. dust ports, they collect about 90% of the dust—a very reasonable amount.

Blade-elevation and blade-tilt controls are similar on both of the tablesaws. The blade is elevated with the familiar crank arrangement. Blade tilt is controlled by unlocking a lever, setting the bevel, and locking the setting with the lever. Neither saw has gear-driven bevel controls; instead, the trunnion swings freely when it's unlocked.

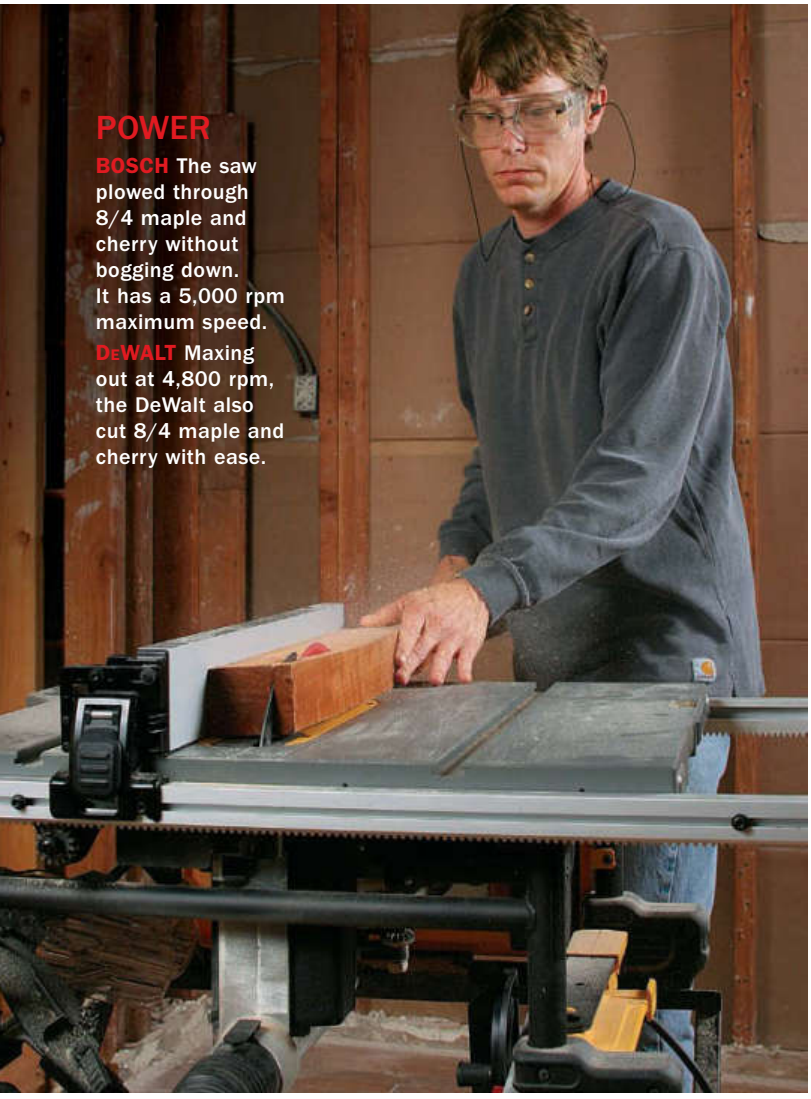
Miter gauges and rip fences

We found the miter gauges on both the Bosch and the DeWalt saws to be small and flimsy, but job-site tablesaws are seldom used for crosscuts. They are for ripping, and this is where these otherwise similar saws start to show their differences. Both have good rip fences, but they don't work the same way.

Bosch's rip fence grabs sliding rails on the front and back of the table when you push down its locking handle. The DeWalt adjusts with rack-and-pinion gears that move the rails where the rip fence is attached. In addition to offering precise adjustments, this setup keeps the fence parallel to the blade. Another nice

FIVE FEATURES THAT MATTER MOST

In terms of performance, either saw is a good choice. The kind of work you do and how much you value portability should guide your selection. Here are the features worth considering and where the saws' differences become most apparent.



POWER

BOSCH The saw plowed through 8/4 maple and cherry without bogging down. It has a 5,000 rpm maximum speed.

DEWALT Maxing out at 4,800 rpm, the DeWalt also cut 8/4 maple and cherry with ease.





RIVING KNIVES

BOSCH Rotating a small lever under the throat plate (above left) adjusts the height of the riving knife. The knife cannot be removed readily, but it can be lowered to make non-through cuts, although it's harder to adjust than the DeWalt's.

DEWALT The riving knife is adjusted or removed with a lever mounted under the saw table (above right). The setup works great. The saw comes with two riving knives: a finlike one (shown) and a taller one that holds the blade cover.



FENCE DESIGN

BOSCH The rip fence grabs the front and back rails (top photo, opposite). Pushing down on a lever secures the setting. The fence slides with ease and locks tightly.

DEWALT The rack-and-pinion rip fence is precise and easy to adjust with a front-mounted knob. An auxiliary fence (left) folds down for narrow stock and supports wide rips. The push stick is neatly stored aboard the fence.

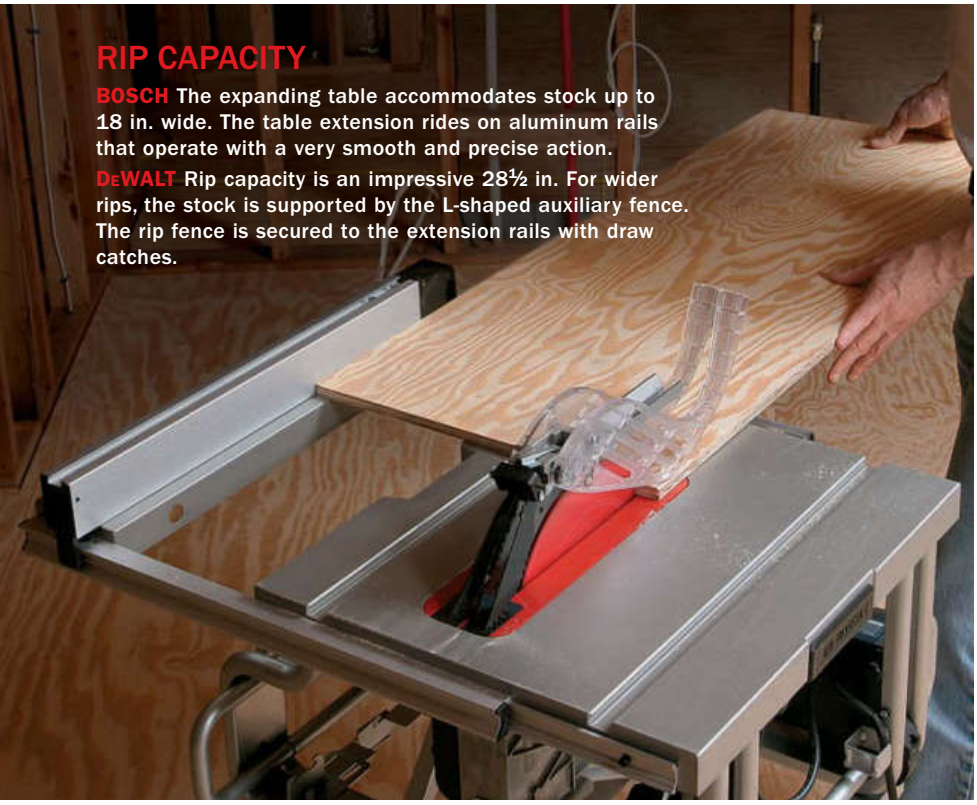
feature on the DeWalt saw is the flip-down auxiliary fence. This low-profile auxiliary fence is good for narrow rips, as it leaves more room for your hands and a push stick. To use it, you need to add its 2-in. width to your measurements when setting the main fence. The auxiliary fence also can be adjusted to support wide rips when it is extended beyond the table. The fence includes a well-positioned storage spot for the push stick.

How we tested

Before testing, we replaced the stock blades with 40-tooth blades ($37 each) from Freud.

We tested the saws by ripping and crosscutting softwood framing lumber. We also cut ½-in. and ¾-in. plywood and oriented strand board (OSB), and we ripped hard maple and cherry in both 4/4 and 8/4 thicknesses.

The saws cut all the materials with ease, including the hardwoods. They cut the 4/4 stock like butter. We had to slow the feed rate slightly with the 8/4 hardwood to keep from bogging down the motor. Even so, the feed rate was reasonable, and there were no burns or obvious saw marks, even with these thick materials. These little saws have a surprising amount of power, but like many portable saws, both of these tools are very loud. Standing in the cutting position and measuring at ear level, the Bosch registered 90 db., and the DeWalt was 85 db. Sound levels were recorded indoors with the saws running but not cutting. They get even louder under load.



RIP CAPACITY

BOSCH The expanding table accommodates stock up to 18 in. wide. The table extension rides on aluminum rails that operate with a very smooth and precise action.

DEWALT Rip capacity is an impressive 28½ in. For wider rips, the stock is supported by the L-shaped auxiliary fence. The rip fence is secured to the extension rails with draw catches.



PORTABILITY

BOSCH At 4½ lb. lighter and with a smaller table than the DeWalt, the Bosch excels at portability. The tubular frame has a surplus of well-placed and comfortable grips, and the stand stays closed when folded.

DEWALT Wider rip capacity and a larger saw table come at the expense of portability. The DeWalt, because of its stand design and weight, is more difficult to carry.

YOUR FEEDBACK

We asked users of the saws for feedback on FineHomebuilding.com and on our Facebook page. Here are some selected comments.

Eric D. Brown Replaced my DW744 with the DW745 when I got tired of lugging its 90 lb. or so into the truck at the end of the day. Love the new one (riving knife, onboard cord, and push-stick storage), but the miter gauge is not the best quality, and I miss the auxiliary support extensions found on bigger saws.

Phil Johnson I purchased the Bosch GTS1031 a couple of years ago for my remodeling business, primarily for its compact size, which allows it to fit into one of the shelving units in my enclosed trailer. I've been very pleased with the performance, and it's a breeze to pull out and set up with the GTA500 stand.

I do use infeed and outfeed rollers when ripping 12-ft. to 16-ft. stock, but I have found the saw quite stable for most of my work. I like the new riving knife and guard system, although I often work without the guard. I've tried ripping down full sheets of plywood, but this isn't the tool for that task, due to its small table size. Overall, I've been very pleased.

Shawn Burgess I've been using the DeWalt DWE7491RS with the wheeled base. This saw is a breath of fresh air compared to my previous DeWalt tablesaw. The features I notice the most when I'm using the saw are the wheels, which allow easy setup, the push-stick holder on the back of the fence (right where you need it), and a storage place on the saw for accessories when they are not in use. The height adjustment wheel is very fast, the bottom cage is so open that no dust accumulates within the saw, and the fence is easily reversible. So far, I wouldn't even think about buying another saw.

They do dadoes

Both saws accept stacked dado sets. The DeWalt can cut dadoes up to 13/16 in., while the Bosch maxes out at ½ in. Matching dado throat plates are sold separately.

Both saws are available with stands. Bosch's simple folding stand weighs 14 lb. and sells for about $80. The saw is secured to the stand with a pair of metal clips and a draw catch. The setup works well and makes it easy to break down the saw.

DeWalt offers two saw/stand combinations. The DWE7490X comes with a folding stand that weighs about 16 lb. It's meant to be bolted to the saw, making setup and breakdown more difficult. Rather than use the supplied bolts and locknuts, we connected the saw to the stand with bolts and star knobs, which made it easier to separate the saw from the stand for better portability. DeWalt also offers a wheeled stand with folding legs that's sold in combination with the DWE7491RS ($580). The stand is sturdy, but it brings the saw's weight to 90 lb.

The verdict

Choosing a favorite from these two saws is tough; both have stand-out features. We much prefer Bosch's stand, but we like DeWalt's rip fence. If pressed, we'd pick the DeWalt, but if portability was the first concern, we'd pick the Bosch. □

Fine Homebuilding associate editor Patrick McCombe contributed to this article.

Drill Presses



Floor-standing models have more power, capacity, and convenience than benchtop models

While a benchtop drill press will be adequate for the majority of holes you drill, there will be times you'll want the power and capacity of a full-size machine. On average, floor-mounted drill presses offer more power, larger tables, and more swing (the distance between the post and the chuck). Most importantly, many of today's machines have 4-in.-plus of quill travel (the distance they can plunge a drill bit), which not only makes deeper holes possible but also means you won't have to adjust the table height as often.

Drill presses haven't evolved far from their machine-shop roots, so we focused on models with two woodworker-friendly features: quill travel of at least 4 in. and a table that tilts 45° in both directions. That narrowed an enormous field to 10 machines from six manufacturers. (Jet, Powermatic, and Shop Fox had machines that fit our criteria, but they declined to participate.) Chucks ranged from ⅝ in. to ¾ in., all plenty big for woodworking bits. All came prewired for 120 volts.

Clean, consistent holes of any size

The main reasons to choose a drill press over a handheld drill are power and precision. To test power, we used a 2-in.-dia. high-speed steel (HSS) Forstner bit to drill through 2 in. of hard maple. We used Lee Valley and Veritas bits for all the tests.

We ran the bit as close to the recommended 400 rpm as each model allowed, and drilled with a very heavy hand. None of the motors stalled, but we did make the

Photos, except where noted: Asa Christiana

Stand-out machines



EDITORS' BEST OVERALL CHOICE

DELTA 18-900L

The Delta 18-900L was a no-brainer for the Best Overall award. It has the most quill travel, a big table that tilts in both directions, the fastest and easiest speed changes, a quick-adjust depth stop and quill lock, an effective head-mounted laser pointer, and plenty of power and accuracy.

A Delta bonus. *The Delta is the only machine with a usable table insert. It is leveled via set screws, and you can screw into it from below to hold it down.*





EDITORS' BEST VALUE CHOICE

PORTER-CABLE PCB660DP

At one-third the price of the Delta, the Porter-Cable PCB660DP is the most affordable machine in the test and an easy pick for Best Value. It offers a quick-adjust depth stop and quill lock, a good laser pointer, and easy speed changes. The table is small, with a rim that is ¼ in. below the center section (making it hard to clamp at the edges), so you will definitely want to add an auxiliary table. But at $320, this machine is a steal.



READERS' CHOICE

GRIZZLY G7948

READERS' RATINGS: DRILL PRESSES

Readers preferred the Grizzly machine to the editors' choices, by a slim margin.

★★★★½	4.04	GRIZZLY G7948
★★★★½	3.97	DELTA 18-900L
★★★★½	3.94	PORTER-CABLE PCB660DP
★★★★½	3.92	RIKON 30-240
★★★★½	3.88	GRIZZLY G7947
★★★★½	3.80	GENERAL INTERNATIONAL 75-500
★★★★½	3.79	GENERAL INTERNATIONAL 75-700 M1 VS
★★★½	3.70	GENERAL INTERNATIONAL 75-260 M1
★★★½	3.39	CENTRAL MACHINERY 39955
Not surveyed		RIKON 30-236 VS

Photos, this page: John Tetreault

Hard data

POWER



Timed test. *We drilled through 2 in. of maple with a 2-in.-dia. Forstner bit. All the machines handled this tough test well, but elapsed time varied.*

RUNOUT





Measured and real world. *To test drilling accuracy, we used a drill rod and a dial indicator (above), turning the chuck by hand. Then we drilled a series of holes, and inserted the drill shank (right) to check for oversize ones.*

TABLE SQUARENESS



Front-to-back squareness. *With a piece of flat MDF on the table to even out inconsistencies, we placed a square against the drill rod. A few tables had a bit of sag, but the one from Central Machinery (shown) had a lot.*



belts slip on a few—the Rikon 30-236, the Porter-Cable, and the General International 75-700—even after pulling the belts extra tight. That meant we couldn't push this big bit quite as hard on these machines. However, that would only be a problem if you were drilling scores of big holes a day. All of the machines produced very clean holes.

To test runout and accuracy, we tightened ¼-in.-dia. and ½-in.-dia. drill rod (precisely ground lengths of drill steel) in the chuck, placed a dial indicator against the rod, and turned the chuck slowly by hand, letting go before taking each reading. We remounted the rods several times and repeated the test, averaging the results. Runout ranged between 0.001 in. and 0.005 in. We rated anything under 0.003 in. as "good" or better.

To see how this test would be reflected in actual performance, we drilled ¼-in.-dia. and ½-in.-dia. holes in soft pine, plunging the bits slowly to allow any runout to affect the hole diameter. Then we removed the drill bit from the chuck and inserted the shank end into the hole, looking for looseness. All of the machines did much better on this real-world test. The ¼-in. shank fit snugly in all of its holes, while the ½-in. holes had only minor looseness—around 0.001 in. for all machines except the Porter-Cable, which had an extra 0.001 in. of wiggle, still very acceptable. We combined the dial-indicator test and the drilling test into one runout rating.

One table stood out

The variously sized cast-iron tables were not a concern, as most people will place a

TIP

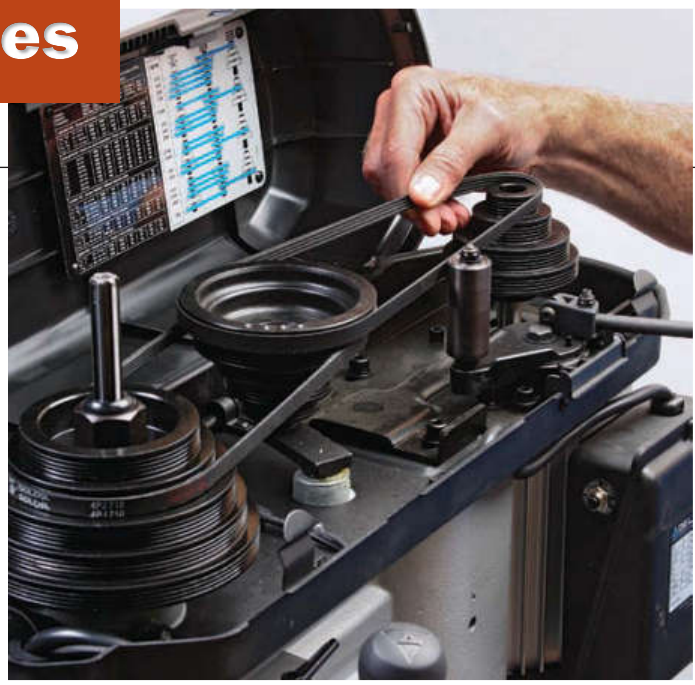
Simple fix. *On the tables with a tiny bit of sag, a few strips of paper under an auxiliary table was enough to correct the problem.*

Friendly features

SPEED CHANGES



Variable is fastest, but ... *On the two variable-speed machines, speed changes happen in seconds. But the General International 75-700 (shown) still requires a belt change between a high and low range, and the Rikon 30-236 doesn't go low enough for the biggest cutters.*



Best of the belts. *With a quick-release tension roller, the Delta's belts were the fastest to change by far.*

DEPTH STOPS

Quick-adjust. *The Porter-Cable, Delta, and Rikon 30-240 machines have a quick-release button on their depth stops as shown here. Others make you spin a nut (or a dial) for big adjustments.*





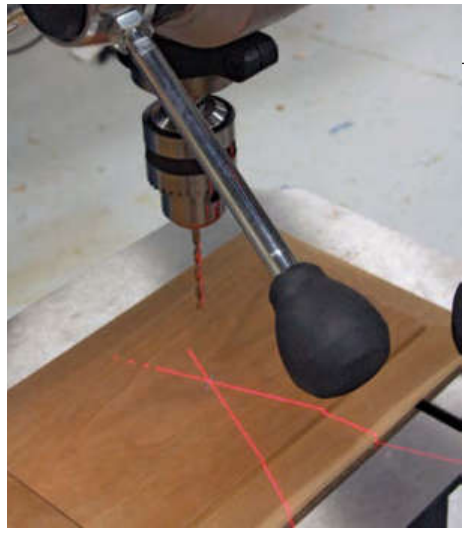
Spindle lock. *Most machines have a way to lock the quill at various heights, which is a must when using a sanding drum. The Delta and Porter-Cable do it with another quick-release button, which is handy.*

TABLE TILT

Delta is unique. *It is the only machine that allows front-to-back adjustment as well as the usual side-to-side, making compound angles possible as well as correcting table squareness.*



LASERS



Not always an asset. *Peck preferred the head-mounted lasers that are hard-wired into the machines, like those on the Delta and Porter-Cable (shown). These are less likely to shift out of alignment than column-mounted models.*



Central Machinery 39955



Delta 18-900L



General International 75-260 M1



General International 75-500



General International 75-700 M1 VS

MODEL	PRICE/ WARRANTY*	MOTOR	SPEEDS/RANGE	SWING	QUILL STROKE	TABLE SQUARENESS (FRONT TO REAR)
Central Machinery 39955	$560/ 90 days	1½ hp	12/ 180–3,865 rpm	20 in.	4¾ in.	Fair
Delta 18-900L	$1,030/ 5 years	¾ hp	16/ 170–3,000 rpm	18 in.	6 in.	Adjustable
General International 75-260 M1	$760/ Lifetime	1 hp	12/ 255–2,750 rpm	17 in.	6 in.	Excellent
General International 75-500	$1,200/ Lifetime	1 hp	12/ 120–2,270 rpm	17 in.	4½ in.	Excellent
General International 75-700 M1 VS	$2,100/ Lifetime	1 hp	VS/280–1,140 and 800–3,200 rpm	22 in.	5⅞ in.	Excellent
Grizzly G7947	$575/ 1 year	1 hp	12/ 210–3,300 rpm	17 in.	4¾ in.	Very good
Grizzly G7948	$695/ 1 year	1½ hp	12/ 210–3,300 rpm	20 in.	4¾ in.	Excellent
Porter-Cable PCB660DP	$320/ 3 years	¾ hp	12/ 300–3,100 rpm	15 in.	4 in.	Very good
Rikon 30-236 VS	$750/ 5 years	1½ hp	VS/ 550–2,300 rpm	17 in.	6 in.	Excellent
Rikon 30-240	$1,050/ 5 years	1 hp	12/ 180–3,865 rpm	20 in.	4¾ in.	Excellent

* Check with manufacturers for limitations.

plywood or MDF auxiliary table on top of theirs to prevent tearout on the bottom of holes. However, with its large overall size, flat edges for clamping, and unique table insert, the Delta's table works fine on its own.

Speed changes separate the pack

While smallish bits can all be run at a similar speed, anywhere between 1,000 and 2,000 rpm, bits bigger than ½ in. dia. should be run in the 500 to 1,000 rpm range, and some very large Forstner bits and wing-cutters should be run even more slowly. So you will be changing speeds pretty often. The time needed to make speed changes varied considerably among machines. In theory the two variable-speed units would shine here, but the General International 75-700 still requires a belt change to get from a lower speed range to an upper one, and that belt change is tedious, thanks to set screws that require an Allen wrench, and a long motor-cover screw that must be completely unthreaded. And while the Rikon 30-236 has a single speed range, adjustable on the fly, it only goes down to 550 rpm. To see if this really was a problem, we used a circle-cutter to cut a 3-in.-dia. hole with the Rikon, stopping when

Photos: this page and opposite: John Tetreault



RUNOUT	AVERAGE SPEED CHANGE	POWER TEST**	QUILL LOCK	WORK LIGHT	COMMENTS
Good	1 min.	10 sec.	Yes	Poor	Weak work light, too much table sag front to back.
Excellent	30 sec.	11.5 sec.	Yes	Good	Best table, easiest belt changes, quick-release depth stop, only machine with front-to-back table adjustment.
Good	2 min., 50 sec.	11 sec.	No	None	Good accuracy but tedious process for changing speeds.
Good	2 min.	11 sec.	No	Very good	Good accuracy, very good work light, useful low-end speed, but difficult belt changes.
Good	Variable, 2 min. range change	12 sec.	No	None	Accurate, but two variable-speed ranges require troublesome belt change.
Fair	1 min., 5 sec.	8 sec.	No	Very good	Tied for most power, very good work light.
Very good	1 min., 10 sec.	8 sec.	No	Very good	Tied for most power, very good work light.
Good	53 sec.	19 sec.	Yes	Very good	Good accuracy, great conveniences, low price.
Excellent	Variable	19 sec.	Yes	Good	Most accurate drill press, and variable speed is easiest to change, but low-end speed is only 550 rpm.
Very good	1 min.	13 sec.	Yes	Very good	Very accurate, with quick-adjust depth stop and very good work light.

** Average time needed to drill 2-in.-dia. hole through 2 in. of hard maple.

the cutter began to overheat and discolor. At 300 rpm, however, another machine had no problem with the same task.

The other eight machines require a belt change for each speed setting, but on most, this took only a minute or less.

Other points to consider

Eight of these units use a rod with an adjustable stop to limit depth. The adjustable stop is a nut that you spin by hand, but on three models—the Delta, the Porter Cable, and the Rikon 30-240—the nut has a quick-release button that lets you make big adjustments rapidly. The Central Machinery and the Rikon 30-236 have the ring near the crank handle that adjusts depth. These also work well.

While laser pointers are not necessary, we preferred those on the Delta and Porter-Cable machines, which are wired to the machine and mounted on the head. The others are battery-operated and mounted on the post, so if the head of the machine shifts you'll have to re-align the lasers. □

William Peck, Fine Woodworking's *shop manager and a retired engineer, contributed to this article.*

Spindle Sanders

The best tool for sanding curved work



Oscillating spindle sanders are a go-to tool for sanding the edges of curved furniture parts while keeping them square to the surface. They're also helpful when cleaning up templates for pattern-routing. The oscillating action of the spindle and sanding drum mounted to it removes stock quickly and efficiently. Some models even offer a tilting table if you want the edge at a consistent angle. There are both floor models and benchtop models available. The most economical option for a home shop is a benchtop unit, so we looked at what's available.

Big table is better

The table on an oscillating spindle sander, usually cast metal, supports the work. To get consistent results, the table must be flat and perpendicular to the spindle. A bigger table is better because there's more area to help support your work. It's important to also think about spindle placement because the more table there is in front of the spindle, the more room there is to work.

Some tables tilt so that you can sand at an angle along a curve. The tables on the Delta, General International, and Jet sanders tilt around the spindle, where

READERS' RATINGS: SPINDLE SANDERS

Both readers and editors picked the Ridgid EB 44242 as their favorite.

★★★★½	4.27	RIDGID EB 44242
★★★★½	4.13	TRITON TSPS450
★★★★½	4.09	GRIZZLY G0739
★★★★½	4.08	JET JBOS-5
★★★★½	4.07	POWERTEC OS-1000
★★★★½	3.99	DELTA 31-483
★★★★½	3.93	WOOD RIVER 157889
★★★★½	3.89	GENERAL INTERNATIONAL 15-220M1
★★★½	3.73	SHOP FOX W1831

Photos: Dillon Ryan

Features that matter

TABLE SIZE



Small tables can be problematic. *With a small table, there is very little real estate in front of the spindle where the action happens. Large workpieces are difficult to handle.*



Support where you need it. *A larger table can handle stock of any size and makes it easier to sand wide or long boards.*

THROAT INSERTS



Poorly sized inserts leave a gap. *The inserts on most of the tested models were out of level with the tabletop, on average by 0.013 in. This gap can cause the workpiece to dip, throwing it out of square and binding as it hits the plate.*



Close up the gap. *The Wood River and Ridgid were the only models with throat inserts adjustable via set screws. A flush insert offers solid registration along the entire top and allows smooth passes for better results.*



Tool free is hassle free. *The Powertec and Ridgid models have thumbscrews for quick and easy drum changes. The thumbscrew applies pressure to tighten the sanding sleeve.*

SPINDLE CHANGES



Tools in tight places. *The Delta, General International, and Jet sanders have separate spindles for each diameter that thread directly into the motor. This design is strong and works well, but to change them you must reach under the table and use two wrenches.*

Testing the sanders





Sanding squarely. *To check that each sander removes material consistently from top to bottom, We marked a board's edge and made one pass. We then used a square to check down the length of the board.*





Dust pickup. *Most models captured more than 90% of the dust, leaving barely a sign of dust on the table (top). A few sanders, though, didn't fare so well in the dust test, collecting less than 50% of it (bottom).* *See chart on p. 74 for specific results.*

Oscillating spindle sanders



DELTA
31-483



GENERAL INTERNATIONAL
15-220M1

RIDGID
EB 44242



WINNER AND STILL CHAMPION

An earlier Ridgid model won Best Overall the last time we reviewed oscillating spindle sanders. This time was no different. The EB 44242 is the most versatile of the bunch, with a big table and great dust collection.



Two tools in one. *The Ridgid's belt-sander attachment stores behind the unit, and attaches as easily as a standard spindle.*



Last shop sander you'll need. *With the belt sander, the Ridgid lets you accurately sand both curved and flat surfaces.*

MODEL	STREET PRICE	TABLE SIZE	MOTOR RATING	SPINDLE/ DRUM SIZES	SPINDLE STROKE	OSCILLATIONS PER MIN.
Delta 31-483	$400	14¾ in. by 14¾ in., tilting	7.5 amps	¼ in., ½ in., ⅝ in., 1½ in., and 2 in.	15/16 in.	29
General International 15-220M1	$520	14¾ in. by 14¾ in., tilting	7.5 amps	¼ in., ½ in., ⅝ in., 1½ in., and 2 in.	15/16 in.	29
Grizzly G0739	$130	11½ in. by 15 in.	3.5 amps	½ in., ¾ in., 1 in., 1½ in., 2 in., and 3 in.	⅝ in.	60
Jet JBOS-5	$490	14¾ in. by 14¾ in., tilting	7.5 amps	¼ in., ½ in., ⅝ in., 1½ in., and 2 in.	15/16 in.	29
Powertec OS-1000	$290	18 in. dia.	2.6 amps	½ in., ¾ in., 1 in., 1½ in., 2 in., and 3 in.	1 in.	30
Ridgid EB 44242	$200	14 in. by 19 in., tilting	5 amps	½ in., ¾ in., 1 in., 1½ in., and 2 in.	¾ in.	60
Shop Fox W1831	$180	11½ in. by 15 in.	3.5 amps	½ in., ¾ in., 1 in., 1½ in., 2 in., and 3 in.	⅝ in.	58
Triton TSPS450	$180	11½ in. by 15 in.	3.5 amps	½ in., ¾ in., 1 in., 1½ in., 2 in., and 3 in.	⅝ in.	58
Wood River 157889	$170	11½ in. by 15 in.	3.5 amps	½ in., ¾ in., 1 in., 1½ in., 2 in., and 3 in.	⅝ in.	58



GRIZZLY
G0739



JET
JBOS-5



POWERTEC
OS-1000

DUST COLLECTION	COMMENTS
Poor	Metal case and throat inserts. No 3-in. spindle. Includes 4-in. dust collection adapter, which didn't improve performance during testing, onboard storage for spindles with sleeves, inserts. No tool storage.
Poor	Metal case and throat inserts. No 3-in. spindle. Includes 4-in. dust collection adapter, which didn't improve performance during testing, onboard storage for spindles with sleeves, inserts. No tool storage.
Very good	The noisiest machine, tested at 94 db. Includes onboard storage for drums with sleeves, inserts, and tools. Workspace in front of drum is limited to 4 in. wide by 9 in. long.
Poor	Metal case construction and throat inserts. Includes a ¼-in. spindle but no 3 in., and onboard storage for spindles with sleeves, inserts. No tool storage.
Excellent	Motor stalled under heavy load. Includes onboard storage for drums with sleeves, inserts, and tools.
Good	Includes a 4-in. by 24-in. oscillating belt sander, adjustable throat for flush-mounted inserts, and onboard storage for drums with sleeves, inserts, and tools.
Very good	Includes onboard storage for drums with sleeves, inserts, and tools. Workspace in front of spindle is limited to 4 in. wide by 9 in. long.
Very good	Includes onboard storage for drums with sleeves, inserts, and tools. Workspace in front of spindle is limited to 4 in. wide by 9 in. long.
Very good	Adjustable throat for flush-mounted inserts. Table machining was rougher than similar units. Includes storage for drums with sleeves, inserts, and tools. Workspace in front of spindle limited to 4 in. wide by 9 in. long.



SHOP FOX
W1831



TRITON
TSPS450



WOOD RIVER
157889

the Ridgid tilts on the portion of the table in front of the spindle.

Dust is the enemy

These units make a lot of fine dust, so dust collection is a concern. When hooked up to a Bosch VAC090A vacuum, most of the units tested collected at least 90% of the dust.

Dust collection was poor on a few machines because the space below the table is open. This provides access when attaching the spindles, but significantly reduces the airflow. As a result, less than 50% of the dust was captured.

Easy spindle changes are a plus

What's great about these sanders is that you can change out the drum sizes to sand different-size curves. There are two ways to make this change. Most of these sanders have a single, permanently mounted spindle shaft that holds different-size sanding drums. The drums slip over the shaft and a nut and washer on top are tightened to compress the drum so that it holds the sanding sleeve tightly. Other units, such as the Delta, General International, and Jet sanders, use different size spindle shafts for each drum size—a less convenient system (see photos on p. 73).

Because of the various size spindle attachments, inserts, and tools required to replace the drum or spindle, it's helpful if the machine has onboard tool storage.

The choice is easy

Overall, it's hard not to like the versatility of the Ridgid unit. It has the largest table and the spindle is mounted toward the rear, providing a huge amount of usable space. The real icing on the cake is the oscillating belt sander, which stores neatly in the sturdy plastic housing. Because of all this, the Ridgid is Best Overall and Best Value. ☐

Fine Woodworking *shop manager William Peck contributed to this article.*

Benchtop Mortisers

These tools cut square holes fast and easy



The mortise-and-tenon joint is strong, reliable, and versatile, suitable for tables, chairs, casework, and more. Many woodworkers, however, find the mortise half of the joint to be a challenge. To cut it by hand you need only a chisel and mallet, but it takes time to learn the technique. Drilling or routing out the waste and then squaring up the walls with a chisel also works, but it, too, is time-consuming.

A better tool for the job is the hollow-chisel mortiser. The machine's head is fitted with a square, hollow chisel with a drill bit running through the center. As you plunge the chisel and bit into the wood, the bit removes most of the waste, and the chisel squares up the hole.

Although mortisers come in a variety of sizes, a benchtop model will cut just about every mortise you'd need for furniture. Benchtop mortisers have enough power to plunge a chisel up to ½ in. square into hardwoods, and they cost significantly less than larger, floor-standing machines.

We tested 11 benchtop models to find out which ones perform the best.

Power, leverage, and ease of use

It's not easy to plunge a chisel and drill bit simultaneously into wood, so a mortiser needs a strong motor, and a handle that creates leverage. We tested all of the machines with the same ½-in. bit from Charles Schmidt and Company (sharpened between machines). With models that have less than ¾ hp, you'll need to slow the feed rate in harder woods to keep the chisel and bit from clogging. However, most furniture mortises are between ¼ in. and ⅜ in. wide, and all of the machines easily cut mortises in that range. For leverage, you want a longer handle that's easy to adjust.

Most important is how easy the mortiser is to use. Adjustments to the fence shouldn't require a tool. The depth stop should be quick to operate without tools. And the drill chuck should be easily accessible.

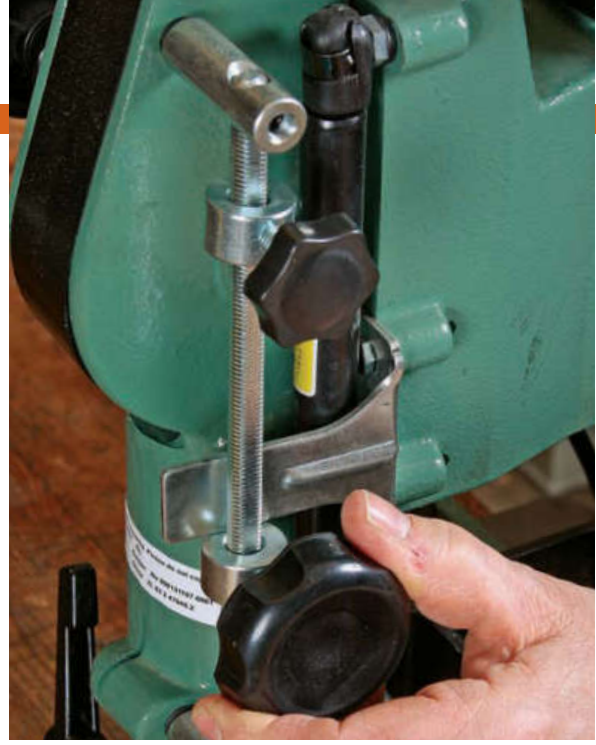
Two mortisers rise to the top

All of the machines tested, except for the one from Baileigh Industrial, are capable of cutting mortises accurately and maintaining their settings so that you

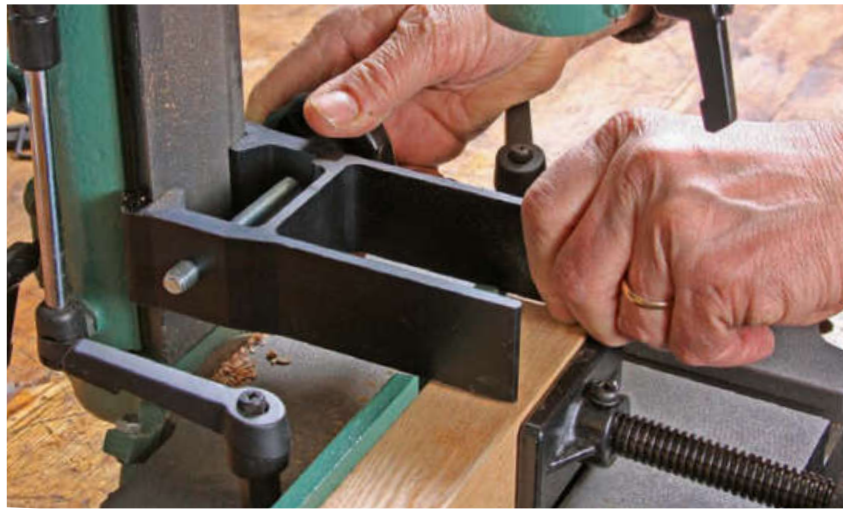
Photos, except where noted: Matt Kenney



Make sure the fence is square. *When you mortise a part, you press it against the fence with a clamp, rollers, or your hand. If the fence leans in or out, the mortise won't be square to the edge. All of the mortisers tested—except the Baileigh Industrial MC-625—had square fences.*



Two stops in one. *The bottom stop controls the depth of cut, and the top one allows the chisel to clear the part without having to raise the lever fully—a convenience featured only on the General International 75-050T.*



Tighten in a flash. *The large knob on the General International 75-050T is easy to turn, and always there, so adjustments are fast.*

can cut a series of identical mortises. However, the power and convenience of the Powermatic PM701 and General International 75-050T make them stand out.

The Powermatic has a powerful ¾-hp motor, so it cuts quickly, even with a ½-in. chisel. It's also the most user-friendly. Every adjustment (except the drill chuck) is made without a tool, and the stop, fence, and hold-down moved smoothly and easily. The fence locks down with two cam levers. Access to the drill chuck is easy via a door that snaps open easily; inside, there's plenty of room for the chuck key and your hand.

The General International 75-050T is a great machine, too. The only mortiser in the test with a tilting head, it's the best choice for anyone who cuts angled mortises on a regular basis, like a chair maker. The head also rotates, so you can cut mortises on parts that wouldn't fit under the chisel otherwise.

The Wood River mortiser is the Best Value among these machines. It has a big table with extensions, rollers to hold parts against the fence, and you can reposition the lever with one hand.

Roland Johnson contributed to this article.

READERS' RATINGS: BENCHTOP MORTISERS

Readers and editors both liked the Powermatic best. The Best Value Wood River didn't score as well with readers.

4.5 stars	4.34	POWERMATIC PM701
4 stars	4.00	BAILEIGH MC-625
4 stars	3.99	GENERAL INT'L 75-050T
3.5 stars	3.71	JET JBM-5
3.5 stars	3.68	SHOP FOX W1671
3.5 stars	3.67	WOODTEK 138224
3.5 stars	3.56	GRIZZLY G0645
3.5 stars	3.54	DELTA 14-651
3.5 stars	3.50	GENERAL INT'L 75-040
3 stars	3.41	WOODTEK 876775
3 stars	3.22	WOOD RIVER 151223

Online Extra

To learn how to sharpen a hollow chisel, watch the video at **FineWoodworking.com/TG2016.**

Benchtop mortisers

We tested the machines with the same ½-in. bit, sharpened between tests. All the machines were able to cut mortises adequately, but the best offer a combination of power and convenience that makes them stand out from the crowd.

POWERMATIC PM701

EDITORS' BEST OVERALL CHOICE

READERS' CHOICE



GENERAL INTERNATIONAL 75-050T

EDITORS' BEST OVERALL CHOICE



WOOD RIVER 151223

EDITORS' BEST VALUE CHOICE



BAILEIGH IND. MC-625



DELTA 14-651



GENERAL INTL. 75-040



GRIZZLY G0645



JET JBM-5



SHOP FOX W1671



WOODTEK 138224



WOODTEK 876775



Photo of Powermatic: Roland Johnson

MODEL	STREET PRICE	MOTOR	HOLD-DOWN	CLAMPING	FENCE	TABLE	DEPTH STOP	COMMENTS
Baileigh Industrial MC-625	$395	½ hp	None	Good	Poor	Poor	Poor	Only mortiser with an X-Y table.
Delta 14-651	$330	½ hp	Good	None	Very good	Good	Good	Includes four chisels (¼ in., 5⁄16 in., ⅜ in., ½ in.).
General International 75-040	$560	½ hp	Good	Excellent	Very good	Excellent	Good	Includes four chisels (¼ in., 5⁄16 in., ⅜ in., ½ in.).
General International 75-050T	$630	½ hp	Excellent	Very good	Very good	Fair	Very good	Includes four chisels (¼ in., 5⁄16 in., ⅜ in., ½ in.); tilting head makes it ideal for chairmaking.
Grizzly G0645	$265	½ hp	Good	None	Very good	Very good	Good	Includes four chisels (¼ in., 5⁄16 in., ⅜ in., ½ in.).
Jet JBM-5	$355	½ hp	Good	None	Fair	Very good	Good	MDF table can be replaced with shopmade jigs or larger table.
Powermatic PM701	$490	¾ hp	Excellent	Good	Very good	Very good	Very good	Every adjustment, except for drill chuck, can be made without a tool.
Shop Fox W1671	$350	¾ hp	Good	None	Fair	Very good	Good	Includes three chisels (½ in., ⅝ in., ¾ in.).
Wood River 151223	$290	½ hp	Good	Good	Very good	Excellent	Good	Includes four chisels (¼ in., 5⁄16 in., ⅜ in., ½ in.).
Woodtek 138224	$600	1 hp	Excellent	Very good	Good	Fair	Good	Long handle and big motor make mortising easy.
Woodtek 876775	$360	½ hp	Very good	None	Fair	Very good	Good	Includes five chisels (¼ in., 5⁄16 in., ⅜ in., ½ in., ¾ in.).

14-in. Bandsaws

Great for curves and for resawing, these saws are the perfect fit for a home shop



READERS' RATINGS: 14-IN. BANDSAWS

The Laguna 14/Twelve was the top pick for readers and reviewers.

4.66	LAGUNA 14/TWELVE
4.56	LAGUNA 14 SUV
4.32	POWERMATIC PM1500
4.31	HAMMER N3800
4.13	OLIVER 4620
4.12	RIKON 10-351
4.08	GRIZZLY G0457
4.05	RIKON 10-325
3.98	JET JWBS-14SF
3.84	GENERAL INTERNATIONAL 90-170B

The bandsaw may be the most versatile machine in the shop. You can use it to cut curves and joinery, to rip boards (rough and milled), and to resaw. Bandsaws come in a range of sizes, from benchtop models to industrial giants. But the perfect size for many woodworkers is 14 in. It's the first bandsaw most of us should get, and could be the only one you'll ever need. A 14-in. bandsaw has a small footprint, so it fits easily in most home shops.

All bandsaws will rip and cut curves. The real test for these machines is resawing wide boards, because it requires a lot of cutting height, a strong motor, and a guide post that doesn't flex. So we tested only saws that can resaw boards at least 10 in. wide without the addition of a riser block, and that have motors of 1½ hp or more.

During the test, we cut curves, made rip-cuts, resawed wide boards, changed the blade, and adjusted the guides. We also checked features such as dust collection and the fence, which have a direct impact on the saw's performance. Read on to see which saws made the cut, and which ones fell short.

Roland Johnson contributed to this article.

Photos, except where noted: staff

Packed with power and user-friendly features

After all of the tests were complete, two saws stood out. The Powermatic 1500 and Laguna 14/Twelve are both great saws, and earn Best Overall honors. The Laguna also is the Best Value and Readers' Choice.



POWERMATIC PM1500

Street price: $2,900

This is a great saw all around. All of the important adjustments are made without tools, and the guides can be set accurately with ease. Tracking the blade is simple, too, due to the window in the upper housing and yellow tires on the wheels. The 3-hp motor easily handled the resaw test—better than all of the other saws.



LAGUNA 14/TWELVE

Street price: $1,097

The Laguna is full of smart features. No tools are needed to install a blade and adjust the guides. It has the largest throat of the saws tested, making blade changes much easier, and the aluminum throat plate has leveling screws. The guides are ceramic, a welcome feature on a saw in this price range. The motor is wired for 110 volts, a plus for those without access to a 220-volt circuit.

Photo, left: Roland Johnson

Details that make a difference

HASSLE-FREE BLADE CHANGES

Unless your bandsaw is dedicated to a single type of cut, say for resawing, you'll need to change blades. It should be easy to install blades, and then to tension and track them.



Quick-release tension speeds up blade changes. *Most saws have a lever that releases or engages tension on the blade. Flip the lever and the tension releases instantly. Without it, blade changes take longer.*



Guards shouldn't get in the way. *On the Oliver and General International (shown) saws, the blade slot pinches together at the top of the guard, making it difficult to install and remove the blade.*



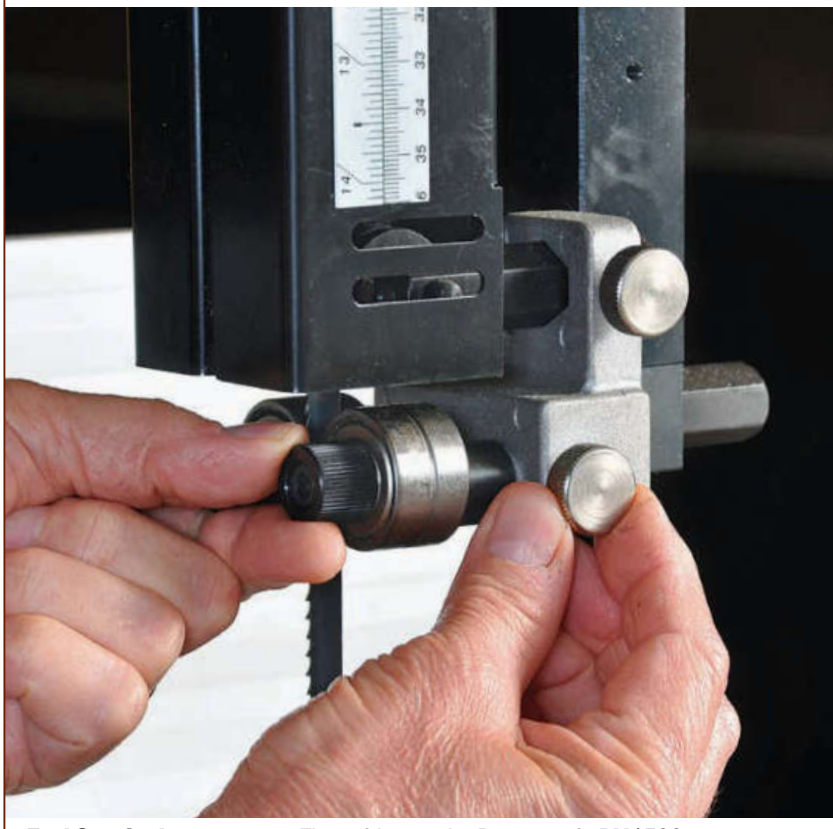
Window makes blade tracking easier. *You can see when the blade is centered on the tire. The Hammer, both Laguna machines, and both Rikon saws have one. A light-colored tire, like the one on the Rikon 10-325 (shown), is a great aid, too.*

Online **Extra**

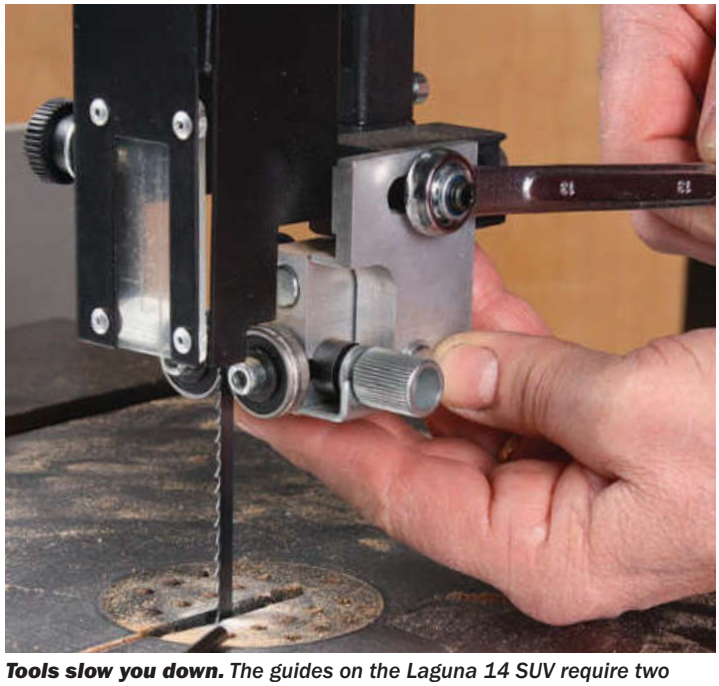
To watch a video on the right way to change a bandsaw blade, go to **FineWoodworking.com/TG2016.**

GUIDES THAT ARE A SNAP TO ADJUST

Setting the blade guides should not be a frustrating experience. Toolless adjustments make it a quick and stress-free job.



Tool-free is the way to go. *The guides on the Powermatic PM1500 were the easiest to set up and adjust.*



Tools slow you down. *The guides on the Laguna 14 SUV require two different wrenches (one box end, one Allen), making adjustments more cumbersome.*

Photo, top right: Roland Johnson



FENCES THAT RIP AND RESAW

Two-position fences are convenient, especially when they can be adjusted without tools.



Two-position fences are safer. *No matter how tall the workpiece is, you can always get the guide bearings close to it with this type of fence. The lower position also provides plenty of clearance for your hand or a push stick.*

GOOD DUST COLLECTION

Bandsaws create a lot of dust quickly, especially when resawing, and you need a well-placed dust port to catch it.

Under the table works best. *It pulls in the dust as soon as it's made, and gets nearly all of it. The Rikon 10-351 (shown) and both Laguna saws have a port there.*





Lower ports miss too much dust. *Falling dust is able to escape the port's reach. Both the Grizzly (shown) and Hammer saws have low ports.*

FOOT BRAKE SPEEDS UP THE WORK

The brake brings the wheels and blade to a halt within seconds, allowing you to begin your next cut more quickly. Without a brake, it can take 30 seconds or more for the wheels to stop spinning.



Stop it with a step. *The foot-activated brake frees up both hands to control the workpiece. Five saws have a foot brake: General International, Hammer, Laguna 14 SUV (shown), Powermatic, and Rikon 10-351.*

14-in. bandsaws compared

We tested the bandsaws by resawing 10-in.-wide cherry, and cutting curves in 1-in.-thick poplar. Along the way we evaluated the ease of changing blades, adjusting the guides, and using the fence. Each saw was equipped with its own pair of Carter bandsaw blades—one for resawing, one for curves.



General International 90-170B



Grizzly G0457



Hammer N3800



Jet JWBS-14SF

MODEL	STREET PRICE	MOTOR	RESAW CAPACITY	EASE OF BLADE CHANGES	EASE OF GUIDE ADJUSTMENTS	GUIDE-POST ALIGNMENT
General International 90-170B	$2,075	1½ hp	12 in.	Poor	Good	Fair
Grizzly G0457	$1,075	2 hp	10 in.	Good	Good	Very good
Hammer N3800	$1,750	2 hp	12¼ in.	Good	Good	Poor
Jet JWBS-14SF	$1,600	1¾ hp	13½ in.	Very good	Excellent	Good
Laguna 14 SUV	$1,800	3 hp	14 in.	Good	Good	Excellent
Laguna 14/Twelve	$1,097	1¾ hp	12 in.	Very good	Very good	Excellent
Oliver 4620	$1,500	1½ hp	12 in.	Fair	Good	Good
Powermatic PM1500	$2,900	3 hp	14 in.	Very good	Excellent	Very good
Rikon 10-325	$900	1½ hp	13 in.	Fair	Poor	Very good
Rikon 10-351	$1,600	3 hp	14 in.	Good	Good	Good

Photo of Jet saw: Roland Johnson



Laguna 14 SUV



Oliver 4620

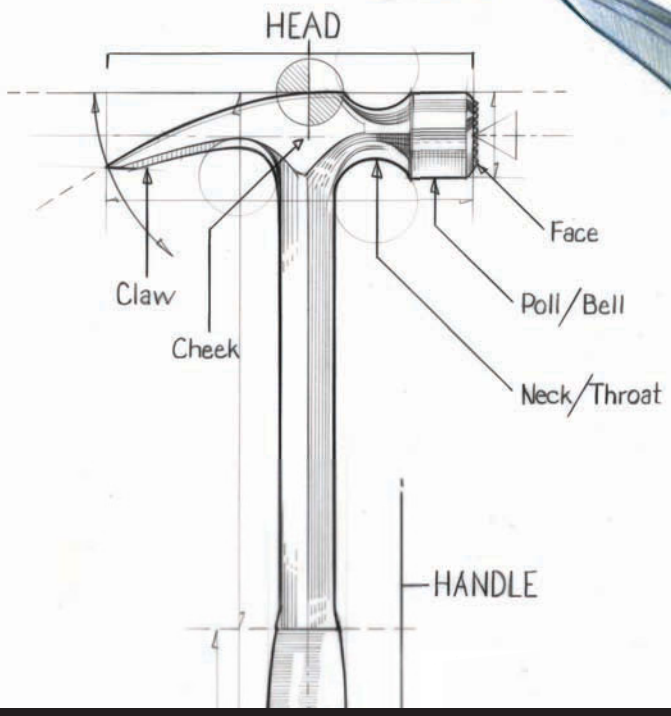


Rikon 10-325



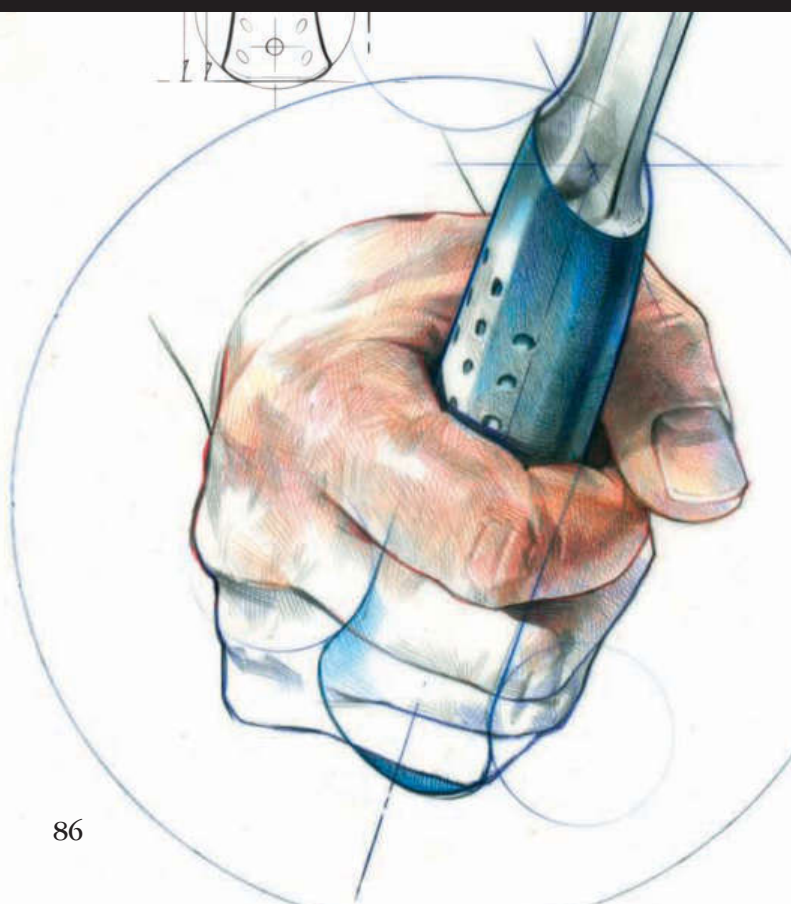
Rikon 10-351

GUIDE-POST RIGIDITY	DUST COLLECTION	FENCE	RESAW CUTS	CURVE CUTS	COMMENTS
Very good	Very good	Very good	Good	Good	Stout upper guide post provides solid support for resawing. Foot brake stops blade quickly.
Good	Fair	Excellent	Very good	Very good	Great two-position fence changes over quickly. Table height is perfect for detail work. Base cabinet provides convenient storage for blades and gear.
Fair	Very good	Very good	Very good	Good	Guides are adjusted without tools. Blade guard slightly obscures view of the cut line. No quick-release tension lever.
Good	Very good	Excellent	Good	Good	Has a great two-position fence with an etched scale and micro-adjust knob.
Good	Excellent	Good	Excellent	Good	Huge throat plate makes it very easy to get blades in and out. Motor easily handles massive resaw capacity.
Good	Very good	Very good	Good	Very good	Excellent two-position fence, big table, and plenty of power.
Very good	Very good	Very good	Very good	Good	T-square fence has rollers for easy movement and T-slots in the fence rail for add-ons like a tall resaw fence.
Good	Good	Excellent	Excellent	Very good	Fence and guides are easy to adjust, and front brake stops the blade quickly. Every adjustment is made without tools.
Poor	Fair	Good	Good	Very good	Yellow tires and window in upper housing make blade tracking very easy. Base cabinet provides convenient place to store blades and gear. Includes lamp.
Fair	Excellent	Good	Very good	Very good	Tool-free blade-guide adjustments, big door on the blade guard, and unique blade tension lever make for quick blade changes. Includes LED light.



Hammers

From rocks to titanium, hammer design has a rich history



Most carpenters think that their hammer is the best hammer, and they are happy to tell you why. But hammers, too, have a story to tell. Their designs have evolved over the millennia, always moving us closer to that goal: letting them do the work.

Still building Rome

We humans have had some time to think about hammers. Even in the Stone Age, there was great sophistication in choosing the right stone for the job, and much later, the right stick, bone, or antler to tie the stone to with sinew or other materials. But it was not until the Roman Empire that a nailing hammer emerged. Dating from the first century, it had a wood handle attached to a metal head with a striking surface on one side, and a split, curved claw for pulling nails on the other.

The Romans made extensive use of nails for construction, and it's a legacy that persists in our nail-sizing system: The "d" stands for the Roman coin denarius, which was presumably worth 10 donkeys. Nails were priced per hundred so 100 8d nails was equal to 80 donkeys.

Drawing: Bruce Morser

For centuries, the head and handle underwent countless interpretations from blacksmith to blacksmith, but these were slight modifications from that Roman design. While the use of steel for hammerheads is thought to date back to the Romans, the widespread use of hickory (unique for its strength, density, and excellent shock resistance) for handles did not occur until the mid-19th century in America. From the beginning, the single greatest design challenge was keeping the head securely affixed to the handle.

Revolutionaries

Around 1840, a carpenter in a small crew hired to build a church in Norwich, N.Y., realized he had left his hammer back home. The local blacksmith was David Maydole, who had been experimenting with hammer designs. Maydole was frustrated by the tendency for hammerheads to fly off. Inspired by the extended eye of an adz—a tool similar to an ax—he added a tapered neck to wedge the handle inside the head, resulting in the adz-eye hammer. As the story goes, the carpenter was so happy with Maydole's hammer that the rest of his crew decided to order them. Word spread and a New York City tool merchant placed a standing order with Maydole for as many hammers as he could make. In 1845 he founded the David Maydole Hammer Co., which grew to be one of the largest hammer manufacturers in the United States.

In Fly Creek, N.Y., 40 miles away from Maydole's operation, another inventor, Henry Cheney, introduced a nail-starting system near the claw, which he patented in 1871. That, however, is not the design that made his name famous. The popular Cheney Nailer was introduced in 1927, 50 years after Cheney's death. That hammer was based on a modified patent by Arthur Taylor and Scott Hinman of Elyria, Ohio, and was disingenuously marketed as the "world's standard since 1836." This would have meant that Cheney started making this hammer when he was 15 years old.

Cheney's conception of a "hammer that holds the nail" is indirectly at work today in the many modern hammers with a magnetic nail-starting feature. And just as the essence of the Roman claw hammer has endured, so too has Maydole's adz-eye hammer.

The head/handle problem was revisited in 1926 by Ernest Estwing, who introduced a virtually indestructible, forged hammer made from a single piece of solid carbon steel with a lacquered grip made of stacked leather rings. Estwing's design was one of many as a new age of invention dawned. Countless inventors flooded the U.S. Patent and Trademark Office with ingenious modifications and interpretations of the tool.

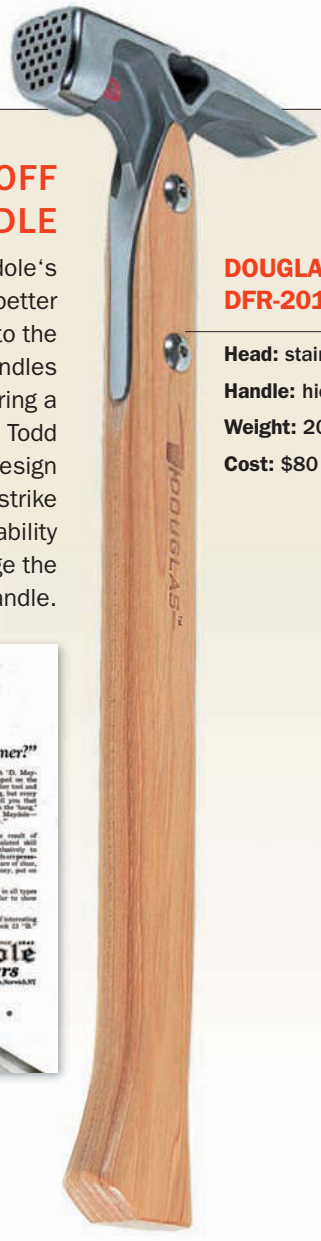
Postwar promise and the age of science

During the 1950s, a growing middle class was realizing the promise of the American Dream for the first time, leading to an unprecedented demand for housing. This ushered in a period of reimagining the hammer to meet those demands. Rather than one crew building one house from start to finish, there emerged framing crews, whose sole charge was to get a house framed quickly and accurately for finish crews to complete. The common hammer—with its short handle, smooth face, and curved claw—had exhausted its potential in this setting and came to be classed as a finish hammer, to be used for tasks less intensive than rough carpentry. Framing became a task for what is now known as the California framing hammer.

DON'T FLY OFF THE HANDLE

While David Maydole's adz-eye hammer better secured the head to the hickory handle, handles still broke, requiring a tedious replacement. Todd Coonrad's Douglas design offers both overstrike protection and the ability to more readily change the handle.





DOUGLAS DFR-2016

Head: stainless steel
Handle: hickory
Weight: 20 oz.
Cost: $80

Framing hammers began as rigging hatchets, which were the primary tools workers in California used to make wood oil derricks before World War II. A rigging-hatchet head has an ax blade on one side and a short-necked milled hammer face on the other. It is balanced, grabs nails well, and has a heavy head weight for lots of striking power. It has a long hickory handle that is either straight or curved with an adz eye or a teardrop-shape (single-bit) eye. For many carpenters, the downside of using a rigging hatchet for home building was the dangerous blade and the tool's inability to extract nails efficiently. Crews began replacing the blade with the claws from old hammers. The late Larry Haun, having seen a modified hatchet on the job, had his first one made in 1954. In 2006, the legendary carpenter wrote: "I took my Plumb rigging hatchet home and cut off the blade with a hacksaw. I had an old Estwing hammer that supplied the claws. I took the pieces to a friend who had an electric arc welder in his garage, and he put the parts together. Although my hammer was a rough-looking tool, it was now safer to use, and I could drive framing nails easily with one lick. The straight-claw, long-handle California framer was born."

Bob Hart, a Los Angeles framing contractor, was one of the first to manufacture these hammers. He began his business by

Inset photos this page and following page: courtesy of Jeffrey T. Cheney

selling his hammers to lumberyards out of the trunk of his car. The popularity of California framing hammers grew through exemplary designs by such makers as Vaughan and Dalluge, and now virtually every manufacturer offers some version of the tool.

Where job-site ingenuity created the California framing hammer, 20th-century science sought to remedy the shortcomings of the solid-steel hammer. Although these hammers were an incredibly strong alternative to wood hammers and were better for pulling nails, they were heavy and provided little shock absorption. Until this time, little, if any, consideration had been given to the end user. Most previous innovations did not go much beyond getting a hammer to drive a nail without breaking. Arm fatigue, the amount of force expended, and comfort were only of peripheral concern.

In 1955, Plumb introduced the first hammers with fiberglass handles as an alternative to wood or steel. The same year, True Temper introduced the Rocket, which boasted a steel-tube handle with a rubberized grip. Hammers such as these signaled the dawn of products marketed as utilizing "space-age technology." Their handles were designed to be shock resistant, ergonomic, stronger than wood, and lighter than solid steel. They were still on the heavy side, however, and did not provide the clarity of sensation that nailing with a wood handle offers. Hammerheads were now being offered with either curved or straight (rip) claws and smooth or milled faces. This period saw the rise of many new hammer designs and materials and also introduced new avenues for refining and building on that progress.

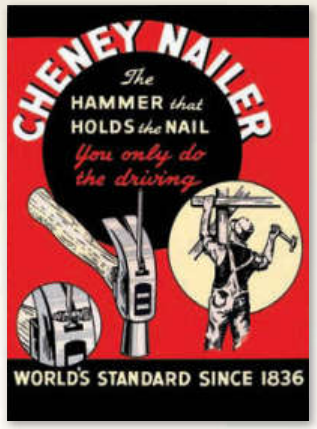
Clash of the titans

As the study of ergonomics matured, researchers could measure how hammers actually work and then develop ways to change them. For example, they were now able to determine the force required to grip a hammer and to understand the way a hammer distributes force when it strikes; this in turn helped them find ways to curb vibration, increase striking velocity, and optimize the sweet spot on the hammer's face. This continuing quest for a better tool shows how far we have come in our story from rocks tied to sticks, but also how little has changed. A hammer's primary function is still about driving nails and extracting them, but there are other functions a hammer needs to do just as well. A hammer needs to pry boards apart and knock elements into alignment. It's also one of the principal tools for demolition work. Each role calls for specifications no single hammer contains. In an attempt to address as many of these roles as possible, manufacturers in the late 1990s introduced materials such as titanium, graphite, and carbon fiber, and features such as side nail pulls, magnetic nail starters, and interchangeable (milled or smooth) faces.

Because you can swing it faster, a hammer with a titanium head can work just as well as one with a steel head. A titanium hammer transfers 98% of the energy from swinging the hammer to the nail, and does so with dramatically less shock than a steel hammer, which transfers only 70% of that energy to the nail. The two principal complaints are that titanium is five times as expensive as steel, and that titanium hammers are cast as opposed to forged. Stiletto Hammers does offer a removable steel face, which

The hammer that holds the nail

Henry Cheney was the first to conceive a hammer with a nail starter in the head, a feature that is nearly standard on modern tools such as this DeWalt, a lightweight steel hammer that gives titanium tools a run for their money.





DEWALT DWHT51135

Head: steel
Handle: steel
Weight: 14 oz.
Cost: $50

Best hammer you've ever owned?

Readers respond on *Fine Homebuilding*'s "Breaktime" forum

"I've only owned about four different hammers, but the Stiletto TiBone Mini-14 is my favorite. It weighs less on your belt, swats nails easily whether you're swinging normally or upside down and left-handed, and has a replaceable steel face to make it 'new' again and a soft rubber handle so your arm doesn't get jarred." —Waters

"I like the leather handle of the Estwing for the cool factor, but I set it aside and pick up the nylon-handled one for everyday use. The main reason for using the nylon one is that once I sanded off the embossed weight/model info on the butt of the handle, it made a nice rubber mallet to bump things into position, snug things up, etc." —AichKay

"I love my 14-oz. Stiletto curved handle. That said, the true winner is my True Temper Rocket, straight claw. At 40 years old, it's still part of my daily arsenal." —KenHill3

Do me a solid

In 1926, Ernest Estwing introduced a virtually indestructible, forged hammer made from a single piece of solid carbon steel with a lacquered grip made of stacked leather rings. In 2001, Mark Martinez began selling the TiBone, the first solid-titanium, lightweight framing hammer.





STILETTO TB15MC

Head: titani·m
Handle: tita
Weight: 15
Cost: $170

Good vibrations

The True Temper Rocket was one of the first hammer designs that attempted to dampen the vibration of the steel handle. Stanley's AntiVibe technology exploits all of the benefits of steel.





STANLEY FMHT51244

Head: steel
Handle: steel
Weight: 17 oz.
Cost: $35

serves several purposes. Steel makes a more durable face than titanium, but the face can also be switched from milled to smooth or replaced when it wears down.

A nearly standard feature on modern hammers is a magnetic nail starter at the front of the hammer, which was first introduced in 1995 on a production-made framing hammer designed by Mark Martinez. In 1999, after acquiring the Stiletto trademark and production rights, he began selling the first titanium-head framing hammer. In 2001, he produced the first solid-titanium hammer, called the TiBone.

DeWalt, owned by Stanley Black & Decker, makes a 14-oz. hammer designed to deliver the striking power of a 28-oz. hammer. For strength, the hammer is made by MIG-welding two forged pieces of steel together. Stanley has a history of putting end-user feedback to use in its hammer designs. Its innovations include graphite handles, shock reduction in its steel hammers through its AntiVibe design, and grips with grooves for sweat to run off.

Possibly the height of aesthetic and functional design in the hammer so far comes from Todd Coonrad. He has a background in industrial design, but it was through his work as a contractor that he began to question and reimagine the hammer. Like many carpenters, Coonrad preferred hickory handles but grew tired of replacing broken ones. In 1995, he developed a unique head-to-handle assembly that not only allows handles to be changed more readily, but, by creating a channel in the handle for the head to slide into, offers overstrike protection, increasing the longevity of the handle. The steel head features both a magnetic nail starter and a side nail pull. Coonrad has had licensing agreements with several manufacturers over the years including Hart, Vaughan, and Dalluge, but now he also produces his impeccably crafted hammers through his own company, Douglas (see photo, p. 87).

Despite all of this innovation—from the prehistoric discovery of a better striking rock, to Maydole's more secure hammerhead, to today's ergonomic wonders—one truth of hammer design has remained constant: The form of a claw hammer expresses a powerful metaphor of our human ability to revise and create. There is forgiveness of the past in the claw, and hope for the future in its face. □

Fine Homebuilding associate editor Aaron Fagan contributed to this article.

Photos, except where noted: Rodney Diaz

TOOL TEST

Coping Saws

Cut curves, cope molding, and speed up your dovetails with this simple saw

VERSATILITY IN A SMALL PACKAGE

With a coping saw, you can quickly get rid of the waste between dovetails (above). The saw's narrow blade also makes it a great tool for cutting curves, like those on a bracket foot (right). And then there's the job it's named for, coping moldings, which it does better than any other tool (far right).





Photos: Matt Kenney

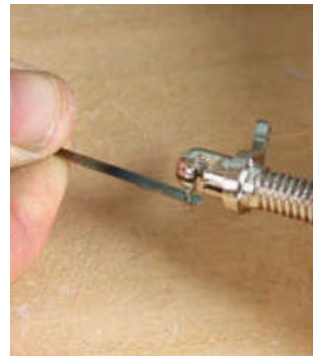
What to look for in a saw

Coping saws can be used to remove waste in joinery, make cope cuts on molding, and saw tight curves of all kinds. Motorized bandsaws and scrollsaws perform similar tasks, but require the workpiece to be brought to the tool, a task that can be difficult, awkward, or even impossible. Often it's more convenient to take the tool to the workpiece. This makes the coping saw an indispensable tool in the woodshop and the job site, serving an essential and useful function that cannot be matched by machine tools.

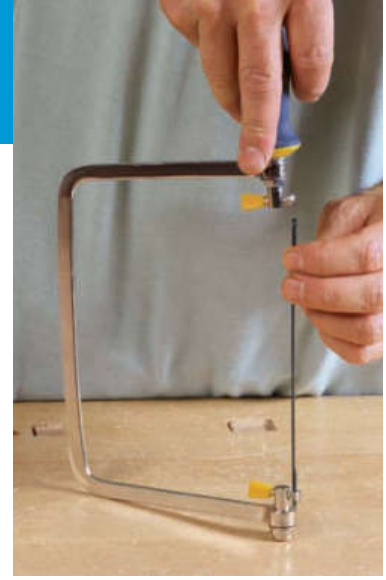
This review considers the 13 coping saws we found on the market. These are simple tools, consisting of a handle, a blade, and a frame. But despite the simple nature of these saws, there is a significant variation in the design and features offered. Regardless of their differences, we evaluated the saws on their critical features: the throat's depth; how easy it is to install, tension, and rotate the blade; and the saw's weight and overall ergonomics.

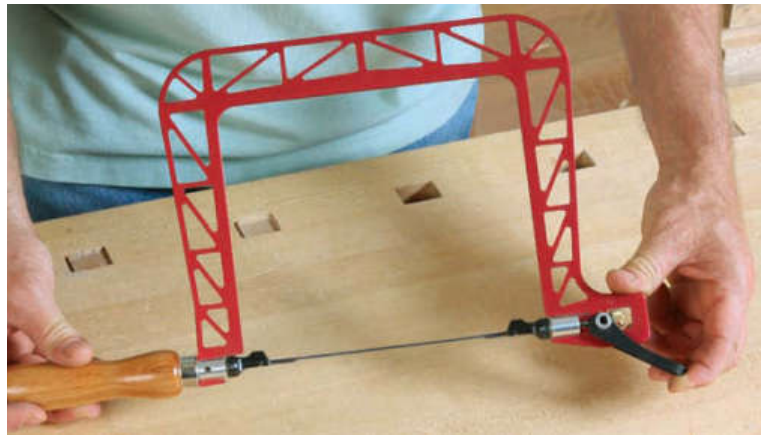
We also used the saws to remove waste between dovetails, cope a crown molding, and cut a curvy bracket foot. In addition

EASY BLADE INSTALLATION



With most saws, flex the frame to install the blade. *The blade has a pin on each end. The pins fit into sockets on the frame (right), and prevent it from slipping during use. To install the blade, put the pin in the outside socket, then push down on the handle to engage the pin in the inside socket (far right).*



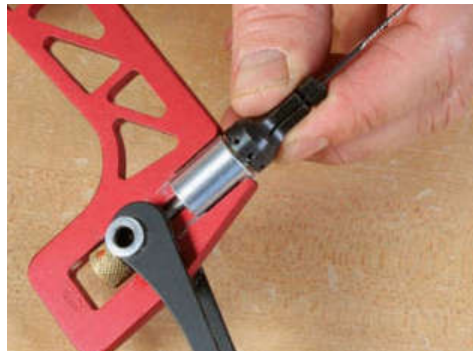


One-of-a-kind features. *Only the Knew Concepts saw has a quick-release lever, a feature that makes for fast blade changes. A knurled knob just behind the lever easily adjusts the blade's tension.*

FAST, PRECISE ROTATION

Navigating curves. *To get around tight corners, you can rotate the blade of the coping saw. Detents are a common way to keep the blade's settings. Many saws have one every 45°.*





An improved twist on detents. *Knew Concepts uses a rotating blade clamp with holes every 15° that fit over a pin to lock in blade angles.*



Inconvenient adjustment. *To change angles on the Irwin saw, you must loosen and retighten the blade, which requires a wrench.*

READERS' RATINGS: COPING SAWS

Both readers and editors loved the Knew Concepts saw.

4.68	KNEW CONCEPTS	
4.41	GRAMERCY TOOLS 12-IN. BOWSAW	
4.25	TEKTON 6865	
4.20	CENTURY DRILL AND TOOL 4940	
4.14	GARRET WADE MULTI-FUNCTION COPING SAW	
4.13	ROBERT LARSON 540-2000	
4.10	LEE VALLEY	
3.59	ECLIPSE 70-CP1R	
3.53	STANLEY FAT MAX 15-106	
3.52	OLSON	
3.51	STANLEY FAT MAX 15-104	
3.49	IRWIN 2014400	
3.44	BAHCO 301	

Coping saws put to the test



to these tests, we measured the amount of blade deflection. Most of the saws showed less than 0.2 in. of deflection, meaning blade tension wasn't an issue during cuts. However, those saws with blades that deflected more than 0.28 in. were noticeably more difficult to cut with because the blades were not taut enough.

The exception to that is the Gramercy Tools bowsaw. Its 12-in.-long blade naturally deflects more than a 6-in. blade. In use, the Gramercy Tools saw cut beautifully and tension was not a problem. With the exception of the Knew Concepts and Gramercy saws, all the coping saws we tested relied on the frame to tension the blade.

TAUT BLADE CUTS BETTER



Taut blades deflect less. *With the blade between a dial indicator and a screw head on the underside of a pivoting arm, we added weight to see how much each blade deflected.*



Low tension equals frustration. *A blade that deflects in the cut makes it hard to pull back and forth and difficult to control. That means the saw might not cut where you want it to.*

MODEL	STREET PRICE	BLADE TENSION*	DOVETAILS	COPING	CUTTING CURVES	BLADE CHANGES	BLADE ROTATION	COMMENTS
Bahco 301	$18	0.209 in.	Very good	Very good	Good	Very good	Good	Misaligned handle; stiff blade-rotation adjuster
Century Drill and Tool 4940	$9	0.295 in.	Good	Good	Good	Very good	Very good	Twisted frame, misaligned handle, poor blade tension
Eclipse 70-CP1R	$15	0.189 in.	Excellent	Very good	Very good	Good	Very good	Rigid frame with smooth blade rotation; blade difficult to install
Garrett Wade multi-function coping saw	$34	0.195 in.	Poor	Fair	Fair	Very good	N/A	Spiral blade that comes with saw cuts slowly; takes standard blades, but they don't rotate
Gramercy Tools 12-in. bowsaw	$150	0.260 in.	Very good	Very good	Excellent	Very good	Very good	Cuts fast due to its 12-in.-long blade, no indents for blade angles
Irwin 2014400	$10	0.165 in.	Very good	Very good	Very good	Fair	Good	Inserting and rotating the blade requires a wrench; handle is uncomfortable
Knew Concepts	$149	0.137 in.	Excellent	Excellent	Excellent	Excellent	Excellent	Light and rigid frame; easiest blade changes with eight positive detents
Lee Valley	$17	0.170 in.	Excellent	Very good	Very good	Very good	Very good	Smooth and easy blade rotation; a very good saw overall
Olson	$13	0.285 in.	Excellent	Very good	Good	Very good	Excellent	Blade can be rotated and locked in any position; poor blade tension
Robert Larson 540-2000	$18	0.164 in.	Very good	Very good	Good	Very good	Good	Handle was misaligned; difficult to rotate blade
Stanley Fat Max 15-104	$6	0.193 in.	Excellent	Very good	Very good	Very good	Excellent	Most comfortable handle; eight positive detents for blade rotation
Stanley Fat Max 15-106	$10	0.284 in.	Good	Very good	Good	Very good	Excellent	Comfortable handle; poor blade tension
Tekton 6865	$4	0.295 in.	Good	Good	Good	Very good	Very good	Uncomfortable handle; poor blade tension

*Number reflects the amount of deflection

Knew Concepts is a cut above

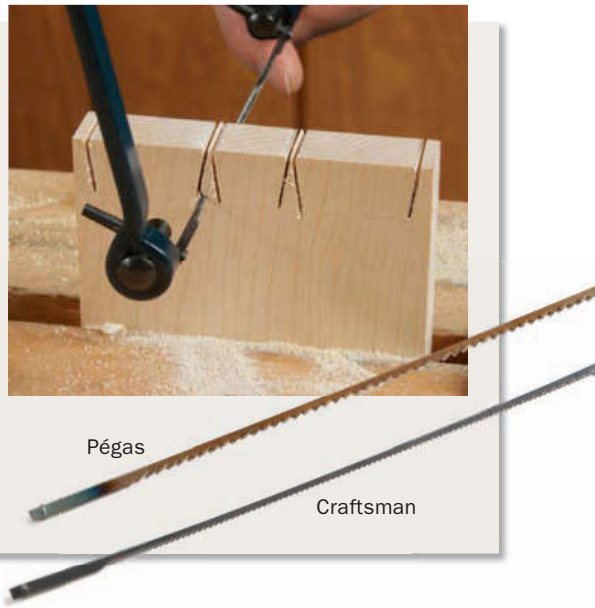
After all of the testing, one saw stood well above the rest: the Knew Concepts coping saw. It is light and rigid. A cam lever makes blade installation a snap, and there is a knurled knob to adjust the blade tension. No other saw provides a convenient way to do that. The pin-and-hole indexing system for blade rotation works very well.

But the Knew Concepts saw is much more expensive than the other saws we tested, except for the Gramercy Tools bowsaw. So the coping saw from Lee Valley, which costs over $100 less, is our pick for Best Value. □

Chris Gochnour contributed to this article.

Two blades make the cut

In addition to testing coping-saw frames, we tested blades. The best blade for removing dovetail waste is sold by Craftsman (No. 36064; $2.50), but only in stores. It's just 0.08 in. wide and can turn in all but the tightest backsaw kerfs so it's perfect for cutting parallel to the joint's baseline, allowing you to remove all but a sliver of waste with a single cut. For coping and cutting curves, we liked the Pégas 10-tpi blade ($6 per dozen). For the cutting tests, we removed the blade that came with the saw and replaced it with these two great blades.



Online Extra

Keep your handsaw skills up to snuff with a series of exercises. See the video at **FineWoodworking.com/TG2016.**

TENON CHEEKS

The all-purpose saw

It might be nice to have several backsaws—a small dovetail saw and a pair of larger saws (one rip, one crosscut) for tenons and other joinery. But it's not necessary, because you can easily cut every furniture joint with just one carcase saw. It's big enough to cut case dovetails, as well as apron and frame tenons, but nimble enough for drawer dovetails. It doesn't matter if the teeth are filed for a ripcut, crosscut, or somewhere between, as long as they are sharpened so that the saw cuts quickly and tracks straight.



SHOULDERS, TOO



DOVETAILS BIG AND SMALL



Backsaws

The versatile carcase saw will cut most joinery—choose from the best of a bumper crop

Dovetail saws are a popular choice for a first joinery saw, but because of the blade's length and shallow depth, they are only suitable for cutting dovetails in thin parts like drawer sides. To cut carcase dovetails, and tenons for door-frame rails and table aprons, you need a carcase saw. With a 12-in.-long blade that has 2 in. or more of cutting depth, the saw is big enough for these joints yet small enough for drawer dovetails. Because it's so versatile, the carcase saw is what we recommend as a first saw to new woodworkers.

During the past 10 years, there has been an explosion of new saw makers and saws, so we took a look at the carcase saws now available. A search turned up 18 saws. Except for one (the Lie-Nielsen tapered crosscut saw), they all have 12-in.-long saw plates, and between 11 and 15 points per inch (ppi). We tested saws with teeth filed for ripcuts as well as saws filed for crosscuts. One saw, the Bad Axe hybrid, has teeth filed between rip and crosscut.

We tested how quickly they cut, and how easy they are to start. We used them to cut dovetails and tenons. We judged how well they track for ripcuts, but not crosscuts. With some ripcuts (such as the tail cuts for dovetails) a cut that goes awry can't be corrected, but a wonky crosscut often can be fixed with a handplane.

A saw's performance hinges on one thing: how well its teeth have been sharpened. Over all, these saws reinforced that theory: The best performers had the best sharpening jobs. Although most hobbyist woodworkers won't need to resharpen a saw very often (every few years at most), we identified in the chart makers who offer sharpening services (see pp. 98-99).

After weeks of using all these saws every which way, we realized that there are a lot of very good saws on the market. However, four were a bit better than the rest, and one was an exceptional value. Keep in mind that several makers are individuals who make each saw every step of the way. The nature of this work means that if you buy a saw from one of them, you might wait weeks or months before it's in your hands. Their saws can often be customized, so for these makers, we've listed the saw's minimum price. It could be higher depending on the options.

Furniture maker Chris Gochnour contributed to this article.

great saws

With the tests completed, it v that most of the 18 carcase saws tested are great, and the difference between them is very small. However, four saws were just a bit better than the rest be- cause they were sharpened extremely well, so they starte easily, cut fast, and tracked perfectly. They also performed well on b rip- and crosscuts. We noticed some difference in comfort among t four saws, but comfort is subj and doesn't affect performanc of them would be a great do-it The Veritas crosscut saw was performer and costs just $79. It's easily the Best Value.



LIE-NIELSEN TAPERED CROSSCUT

At 14 in. long, this saw is 2 in. longer than every other saw tested, and it also had the thinnest saw plate. Its kerf was tied for the narrowest. All of this makes a big difference in how fast the saw cuts. It took the top spot in the ripcut and tied for first in crosscut speed tests.

BAD AXE HYBRID

This saw is like a combination tablesaw blade, with a tooth profile designed to rip and crosscut. It wasn't the fastest at either type of cut, but it did both equally well. Because of the hybrid file, the saw started smoothly in both rip- and crosscuts. Of the saws tested, we liked the handle on this one

READERS' RATINGS: BACKSAWS

Readers and editors liked the Lie-Nielsen, but readers liked the Bad Axe rip saw equally well.

4.74	LIE-NIELSEN TAPERED CROSSCUT
4.74	BAD AXE RIP
4.70	ROB COSMAN TENON
4.69	BAD AXE HYBRID
4.69	LIE-NIELSEN CROSSCUT
4.62	ADRIA CROSSCUT
4.56	GRAMERCY RIP
4.55	ADRIA RIP
4.52	VERITAS RIP
4.50	VERITAS CROSSCUT
4.33	GRAMERCY CROSSCUT
4.32	PAX 1776 TENON RIP
4.09	BLACKBURN RIP
4.03	WINSOR RIP
4.00	LYNX TENON CROSSCUT
3.89	BONTZ RIP
3.83	CROWN TENON RIP

READERS' CHOICE



BAD AXE RIP

Photos: staff



ADI CROS

This saw per wonderfully. for the faste cuts but was for ripcuts, a of a tradeoff the saw's pe we found the to be uncom for larger-tha hands.

ROB COSMAN TENON

This saw was very easy to start, and it cut smoothly. The teeth cut without binding despite having very little set. It has the heaviest spine, and a molded resin handle with individual finger grips. The handle comes in two sizes (standard, extralarge).

VERITAS CROSSCUT

This saw did very well in all of the tests. It ripped extremely fast and tracked great during ripcuts. Crosscuts were very quick, too. It also started smoothly in both rip- and crosscuts. Overall, this is a very good saw and a fantastic value at just $70.

How the saws stacked up



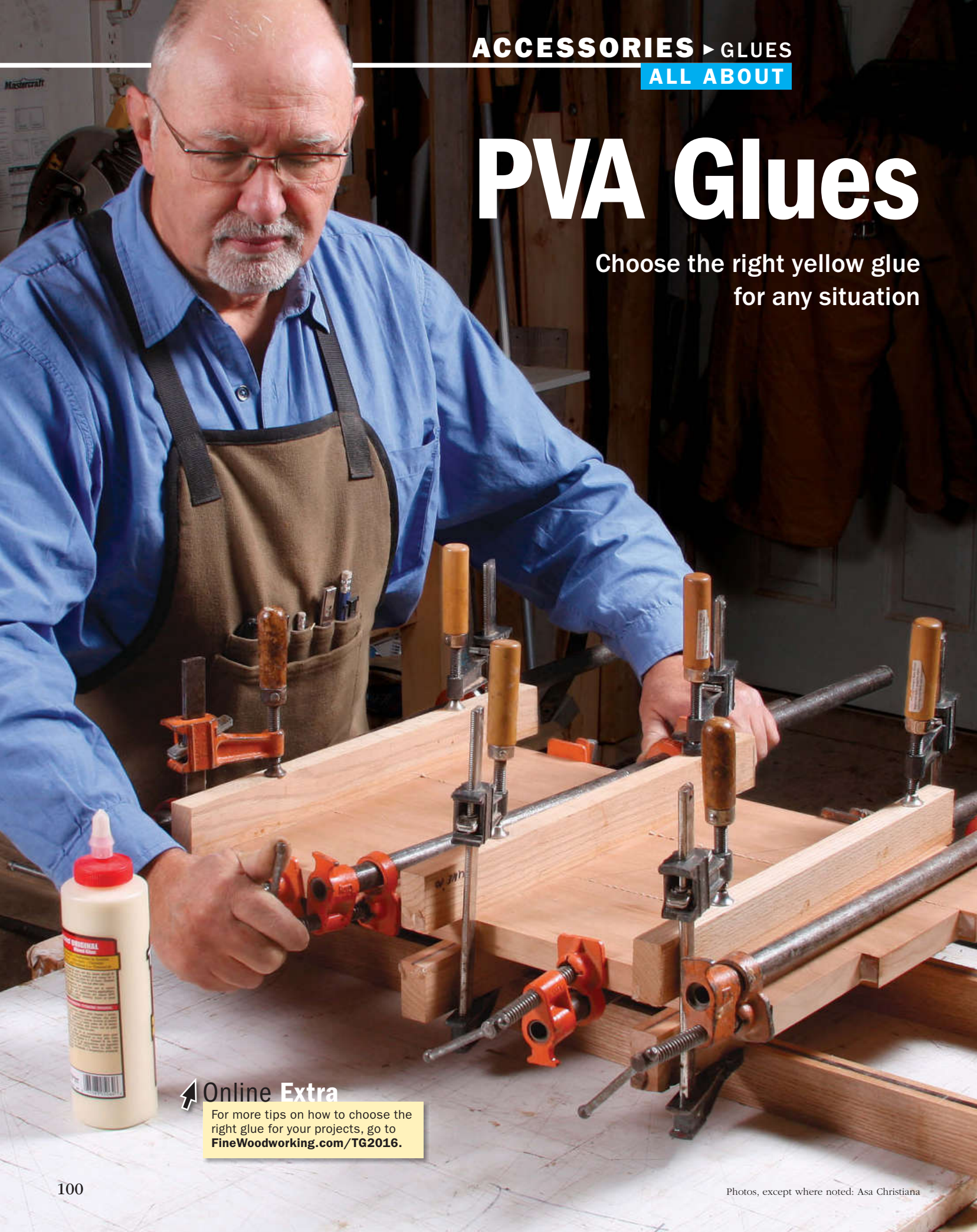
BRAND/STREET PRICE	SPECS
Adria Rip $170	14 ppi Plate: 0.020 in. Kerf: 0.028 in.
EDITORS' BEST OVERALL CHOICE **Adria Crosscut** $170	14 ppi Plate: 0.020 in. Kerf: 0.027 in.
READERS' CHOICE **Bad Axe Rip*** $255 and up	13 ppi Plate: 0.020 in. Kerf: 0.024 in.
EDITORS' BEST OVERALL CHOICE **Bad Axe Hybrid*** $255 and up	14 ppi Plate: 0.020 in. Kerf: 0.025 in.
Blackburn Rip* $275 and up	13 ppi Plate: 0.025 in. Kerf: 0.033 in.
Bontz Rip* $275 and up	14 ppi Plate: 0.020 in. Kerf: 0.026 in.
EDITORS' BEST OVERALL CHOICE **Rob Cosman Tenon** $325	12 ppi Plate: 0.020 in. Kerf: 0.024 in.
Crown Tenon Rip $90	13 ppi Plate: 0.025 in. Kerf: 0.030 in.
Lynx Tenon Crosscut $110	14 ppi Plate: 0.025 in. Kerf: 0.029 in.
Gramercy Rip* $210	13 ppi Plate: 0.020 in. Kerf: 0.026 in.
Gramercy Crosscut* $210	15 ppi Plate: 0.020 in. Kerf: 0.028 in.
EDITORS' BEST OVERALL CHOICE READERS' CHOICE **Lie-Nielsen Tapered Crosscut*** $140	14 ppi Plate: 0.015 in. Kerf: 0.024 in.
Lie-Nielsen Crosscut* $137	14 ppi Plate: 0.020 in. Kerf: 0.028 in.
PAX 1776 Tenon Rip $165	13 ppi Plate: 0.025 in. Kerf: 0.027 in.
PAX Tenon Rip $105	13 ppi Plate: 0.025 in. Kerf: 0.027 in.
EDITORS' BEST VALUE CHOICE **Veritas Crosscut** $79	15 ppi Plate: 0.020 in. Kerf: 0.026 in.
Veritas Rip $79	13 ppi Plate: 0.020 in. Kerf: 0.026 in.
Winsor Rip* $169	13 ppi Plate: 0.020 in. Kerf: 0.027 in.

*Offers resharpening service.

RIP START	RIP SPEED	RIP TRACKING	CROSSCUT START	CROSSCUT SPEED
Very good	Very good	Excellent	Very good	Very good
Excellent	Good	Excellent	Excellent	Excellent
Excellent	Very good	Very good	Excellent	Very good
Excellent	Very good	Excellent	Excellent	Very good
Very good	Very good	Excellent	Very good	Very good
Very good	Excellent	Very good	Good	Very good
Excellent	Excellent	Excellent	Excellent	Good
Very good	Fair	Very good	Very good	Fair
Very good	Very good	Very good	Very good	Fair
Very good	Very good	Excellent	Very good	Very good
Excellent	Fair	Very good	Excellent	Fair
Excellent	Excellent	Excellent	Very good	Excellent
Excellent	Good	Very good	Excellent	Fair
Very good	Very good	Very good	Very good	Fair
Very good	Very good	Very good	Very good	Fair
Very good	Excellent	Excellent	Very good	Very good
Very good	Very good	Excellent	Good	Excellent
Excellent	Excellent	Very good	Very good	Good

PVA Glues

Choose the right yellow glue for any situation



Online Extra

For more tips on how to choose the right glue for your projects, go to **FineWoodworking.com/TG2016.**

Photos, except where noted: Asa Christiana

Woodworking isn't cheap, but glue isn't the problem. That's because our most common adhesive, yellow glue, is inexpensive and works for many tasks. We all know it and love it, but a better understanding of how this glue works, and the wide array of formulations available, will help you get the most from it.

Officially called polyvinyl acetate (PVA), this adhesive came into wide use after World War II. Its predecessor, animal-hide glue, reigned for centuries, going back to the furniture in King Tut's tomb. PVA came with a number of advantages: longer shelf life, more working time, and no need for a heated pot. Also, PVAs could be formulated for different jobs and characteristics, such as water resistance and working time.

PVA glues will bond all types of joinery, many bent laminations, and most veneered panels. And they work well on almost all woods, including plywood and MDF. But it's a good idea to avoid using PVAs on most tropical woods, which contain oils that will interfere with the glue's bond.

PVAs prefer fresh surfaces and tight joints

To get the most strength from PVA glue, you need to know how it works. One critical factor is absorption. Suspended in water, the glue particles are absorbed into the surrounding wood fibers. When the moisture dissipates and the glue hardens, the two adjacent pieces of wood are bonded. That's why joints should be glued right after cutting, sanding, or planing them. If a week or more has passed, surface contaminants can rise from inside the wood and stop the water from penetrating.

The other key to a strong bond is having a very thin, continuous film of glue in the joint. PVA glue is not a good gap-filler. That means good mating surfaces, and powerful clamping force when possible. When you can't clamp the faces of a joint together directly—as is the case with dovetails and mortise-and-tenon joints, for example—the joinery must be snug to ensure success.

Apply the right amount

It doesn't really matter what you use to apply PVA glue, as long as you spread it evenly and thinly over the entire surface of the joint. If all of the surfaces are freshly cut, scraped, or sanded, you don't have to spread PVA on both mating surfaces to get it to soak in. That means you can apply glue to only one face of each joint—whether an edge joint, dovetail, mortise, or lamination—and achieve unqualified success.

Miters are basically end grain, so glue tends to soak into their fibers, starving the joint. There are a variety of approaches to solve this problem. Some woodworkers recommend applying a thin, preliminary layer of glue, and letting it set up and

Conditions for success

PVAS LIKE FRESH WOOD ...



Proper prep. *If more than a day or two has passed since you cut the joints, you should scrape or sand the surfaces to remove oil and other contaminants that can rise from within to prevent absorption.*



Absorption test. *For full strength, a PVA glue needs to soak into the wood. You can test the joint's readiness with water. It beads on a surface that was cut a year ago (left), but soaks quickly into a freshly scraped area (right).*



... AND WARM TEMPS



Too cold. *PVAs only work down to certain temperatures, usually around 50°. If the wood, glue, or air is colder than that, the glue will turn chalky, rendering it useless.*

Tools for applying a thin, even coat

Aside from absorption, the other key to achieving full strength with PVA glue is having a thin, continuous glueline.

THE FINGER METHOD



Apply glue straight from the bottle when possible. *If the joints are freshly cut, you only have to apply glue to one of the mating surfaces in each joint.*



The simplest spreader. *Try using your finger to spread the glue on edge joints, bending it a bit to get more glue in the middle than along the edges.*

BRUSH GOES WHERE FINGERS CAN'T



Doctor it first. *Trim the bristles on cheap flux brushes to make them stiffer, and hammer the ferrule to keep the bristles from falling out.*



Reach into mortises. *Squeeze glue into the mortise, and then spread it with the brush. Glue is not necessary on tight-fitting tenons.*



Biscuits and miters, too. *The brush reaches into biscuit slots and spreads glue on small surfaces like these miter joints.*

SMALL STICKS FOR TIGHT SPACES



Dovetail trick. *Thin sticks reach between tails to apply a thin, even coat. You don't need glue on the pins, but a little on the shoulders doesn't hurt.*

NOTCHED SPREADER FOR BIG AREAS



Trowel is better than a roller. *A spreader with $\frac{1}{32}$-in. V-notches will deposit the perfect amount of PVA glue for veneering and laminations.*



Easy fixes for squeeze-out

PVA glues will show up under almost all finishes, so don't leave any behind. Here is how to make the job as easy as possible.



Don't apply too much. *On clamped joints like panels (left) and miters (above), you should see a small continuous line of squeeze-out. Big beads or drips will be harder to deal with afterward.*

seal the grain before adding more glue, a process called "sizing" the joint. But joint failure is possible with this technique. That's because glue does not stick well to glue that has already skinned over and begun to cure. So instead move more quickly than usual, touching up dry spots before assembling.

Working time: The clock is ticking

The most important attributes of any glue are open and closed assembly time. Open assembly time, or open time, is the amount of time you have between spreading the glue and assembling the joint (but not necessarily clamping it yet). Once the glue is spread, the water begins to evaporate and the glue starts to skin over.

Closed assembly time starts after the surfaces are touching, and tells you how long you have to get the pieces aligned and the clamps tightened before the glue starts to fully cure. Adding open and closed time together tells you the working time—how long you have to complete the glue-up without the joints starting to freeze in place.

A warmer, dryer shop speeds up the clock—Keep in mind that manufacturers' specs are based on an environment where the humidity is mid-range and the temperature is about 72°. In general, a colder or more humid shop will slow down the clock, and a warmer or dryer shop will speed it up.

Clamp time is pretty universal—Clamp time—how long you need to wait before you can remove the clamp pressure—varies based on wood species, humidity, and temperature. Clamps force surfaces and joints together, overcoming all sorts of resistance in the workpieces, from warping to unevenness. The moisture needs to evaporate and the glue has to harden, at least partially, before you can trust workpieces not to shift or move when clamp pressure is released.

If you take off the clamps too soon and a joint opens up, it might be too late to reclamp it without compromising the strength of the joint. Worse, you might not notice the gap,





Scrape it off in stages. *When the glue starts to gel, after half hour or so, remove as much as you can with a flexible scraper (top). After about an hour, remove the clamps and get the rest of the gummy squeeze-out with a cheap, steel-bladed paint scraper (bottom). Grind a fresh edge on each tool for best results, and ease the corners so they don't dig in.*



The right PVA for your project

Standard PVA glues are a shop staple, but there are many reasons to pay more or go online for a special formula.

STANDARD PVA IS CHEAP AND VERSATILE

These have a shorter working time and are less expensive than other varieties, but just as strong.

Price: $4-$5 for 16 oz.
Open time: 5-10 min.
Total working time: 15 min.
Chalk temperature: 50°-55°
Dried color: Translucent yellow

TYPE I OFFERS MORE OPEN TIME

Type I PVA glues are very water-resistant, so they work well for outdoor furniture. They also offer significantly longer working time.

Price: $7-$8 for 16 oz.
Open time: 10-15 min.
Total working time: 25 min.
Chalk temperature: 47°-55°
Dried color: Translucent brown

WHY PAY MORE FOR TYPE II?

These varieties cost roughly $1 more than standard PVA glues, but offer the same amount of working time and only moderate water-resistance.

Price: $5-$6 for 16 oz.
Open time: 5-10 min.
Total working time: 15 min.
Chalk temperature: 50°-55°
Dried color: Translucent orange



TITEBOND ORIGINAL WOOD GLUE

ELMER'S CARPENTER'S WOOD GLUE



TITEBOND III ULTIMATE WOOD GLUE

ELMER'S CARPENTER'S WOOD GLUE MAX



TITEBOND II PREMIUM WOOD GLUE

GORILLA WOOD GLUE



Got 15 minutes? *Standard PVA glue has a relatively short working time, but it's more than enough for many glue-ups. Always do a dry run to get everything set before spreading glue.*



More time makes a big difference. *For complicated glue-ups like this big lamination, a Type I PVA (here Titebond III) allows more time for spreading, positioning, and clamping.*

A few specialists are worth tracking down

You might have to go online to find these products, but they can be lifesavers.

SLOW AND CLEAR

Titebond Extend has the same 25 minutes of working time as Titebond III but a lighter glueline, making it better for whiter woods.

Price: $7 for 16 oz.
Open time: 15 min.
Total working time: 20-25 min.
Chalk temperature: 40°
Dried color: Translucent white

NO SQUEEZE-THROUGH

This PVA contains a filler that stops it from squeezing through porous veneers. It should be used for veneering only.

Price: $10.50 for 1 qt.
Open time: 15 min.
Total working time: 20 min.
Chalk temperature: 50°
Dried color: Brown

GREAT ON END GRAIN

This PVA is thicker so it won't soak as quickly into miter joints. It also grabs quickly, making it great for rub joints.

Price: $8 for 16 oz.
Open time: 35 min.
Total working time: 10-15 min.
Chalk temperature: 50°
Dried color: Translucent tan



TITEBOND EXTEND WOOD GLUE

TITEBOND COLD PRESS FOR VENEER

TITEBOND NO-RUN, NO-DRIP WOOD GLUE



Perfect for pine. *The glueline is dark (top) using Titebond III, but invisible (bottom) using Titebond Extend.*



Stir it up. *The filler in this PVA tends to settle. So stir it up with a mixing attachment before use.*



Miter master. *On end grain, this glue stays on the surface longer, giving you more time to complete the glue-up.*

Product photos, these two pages: John Tetreault

and then let the workpieces freeze permanently in that position. On the other hand, if you wait too long, you won't be able to remove all the glue squeeze-out before it hardens completely. Usually one hour to 90 minutes is about right.

Freshness matters, too

The shelf life of PVA ranges from one year to two, so for most hobbyists, the ubiquitous 16-oz. bottle is the right amount to buy. But if you plan to do laminations or veneering, you can safely buy a gallon or more without much going to waste. If there is no obvious manufacturing date on the bottle, write the date of purchase on it.

Shelf life is shortened if the glue is stored in extreme temperatures: higher than 85° or lower than 55°.

Special situations

Although PVAs get used a lot, even for laminations and veneering, it's not always appropriate. For laminations, go with Titebond III or Titebond Extend, depending on the color of the wood. The extra open time is invaluable for spreading glue and applying clamps. However, if the lamination will be unsupported for more than 4 ft. and carry a lot of weight, choose System 3 G2 epoxy, which is much more rigid and offers even more open time.

We also use PVA glues for veneering. If the wood is tight-grained, like cherry or maple, we'll use a normal PVA glue. But for open-grained, ring-porous woods like ash and oak, or for burls, which have small voids in them, we love Titebond Cold Press for Veneer glue.

However, if the veneer has a lot of patternwork or marquetry on it, PVA is a bad choice. The water in the glue will expand the veneer and distort the pattern. It's also a good idea to avoid PVA for areas over roughly 4 ft. by 4 ft., because you can run out of working time. In these cases, we recommend that you turn to Unibond 800. □

Furniture maker Michael Fortune and special projects editor Asa Christiana contributed to this article.



Fiber-Cement Sawblades

We cut through the contenders to find the longest-lasting,

It's hardly surprising that fiber-cement siding is popular. It is fire resistant, distasteful to bugs, and extremely durable. But let's face it: Fiber cement is a drag to cut with a circular saw. There's that whining racket that comes from milling a cement-based product, and the resulting cloud of silica dust is a health hazard. You can ease the process and save some money by using the right blade. There are swarms of 7¼-in. fiber-cement blades on the market and just as many promises of superior performance. How do you decide which blade to buy? That's where *Fine Homebuilding* editors come in. We dulled 18 commonly available fiber-cement blades and ripped through nearly 12,000 linear ft. of Hardie Plank HZ5 siding to size up the competition.

When you shop for fiber-cement blades, don't be confused by the wide variety of tooth counts, gullet styles, tip types, and price points. Most blades share some common characteristics: deep gullets for clearing away sawn material, a small number of teeth (four is common), and cutting tips hardened with polycrystalline diamond material. Some blades still feature carbide tips that are the norm in woodcutting, but they fared poorly when faced with a fiber-cement product that's more earth than tree. Prices are scattered all over the map, and neither the most expensive nor the least expensive blades could match the value of the mid-priced options.

Torturing the blades

We designed this review to answer the questions we all have about any sawblade. How well does it cut? How much does it cost? Will it last long enough to justify its price tag? Cost was probably the hardest to deal with. You'll have to shop around to get the best

Photos: this page, Patricia Steed; facing page, Andy Beasley



HOW WE TESTED

Consistent cutting force

A wheeled sled drawn by a cable carried a circular saw across three stacked pieces of siding. Outside, pulleys on a 15-ft.-tall gibbet enabled the downward fall of a sand-loaded bucket to pull the saw through the cuts with consistent force.







PROTECT YOUR LUNGS

Inhaling the silica-laden dust produced by cutting fiber-cement siding increases the risk of lung cancer and can cause silicosis, an incurable and debilitating lung condition. Smoking amplifies these risks. Recommended safety steps include cutting outdoors, wearing a NIOSH-approved N-95 dust mask or respirator, and/or using a dedicated fiber-cement saw and a vacuum. For this test, we used a Makita 5057KB fiber-cement saw connected to a Makita vacuum.

most cost-effective blades

deal. The prices listed represent the lower reaches of each blade's price range.

We evaluated each blade's best possible cut by making an out-of-the-package crosscut of a single fiber-cement plank. We carefully examined the freshly sawn edges for smoothness, saw marks, and chipping before rating each cut. Given that the planks are designed to cover a house and not to craft fine furniture, all 18 blades performed adequately or better.

We ran the blades through a standardized endurance challenge to determine how much fiber cement they could cut before becoming noticeably dull. We used a uniform falling weight with a cable-and-pulley system to pull a circular saw through repetitive rips of the stacked material. Using three stacked HardiePlanks accelerated the test and seemed a reasonable simulation of a job-site context of ganged cuts and 1-in.-thick fiber-cement trim boards. We timed each blade's first rip to establish a baseline, then repeated the process until the blade required an additional 50% of its baseline time to finish a cut. The blade was considered dull at this point, and we recorded the total number of cuts it had made. Then we multiplied the total rips by 36 (the combined length of the three 12-ft. planks) to get the total number of linear feet each blade cut before becoming dull.

Finally, we addressed the question of cost-effectiveness by dividing the cost of a blade by the number of linear feet it managed to cut. Expressed as price per cut foot, this measurement rates the actual bang for the buck you can expect from each of the 18 blades.

Andy Beasley contributed to this article.

How well 18 fiber-cement blades lasted

While all the blades performed adequately out of the box, the true test was how much they cut. We ranked the blades based on their price per cut foot. In a few instances, a lower-ranked blade cut more linear feet than the blade ahead of it, but that's a misleading statistic when you consider the price of the blade.



DIABLO D0704DH

TEETH: 4/diamond
PRICE: $47
INITIAL CUT: Good
COMPLETE CUTS: 47
TOTAL LINEAR FT.: 1,692
PRICE PER CUT FT.: 3¢

EDITORS' BEST OVERALL CHOICE

EDITORS' BEST VALUE CHOICE

As the hours dragged by and the dust piled up, this blade's tenacity made it the clear winner in the endurance test. It turned in the fastest cutting times, cut smoothly, and was the most cost-effective choice among all the competitors. It is also the blade recommended by James Hardie Building Products, a leader in the fiber-cement industry.



BOSCH CB704FC

TEETH: 4/diamond
PRICE: $42
INITIAL CUT: Good
COMPLETE CUTS: 29
TOTAL LINEAR FT.: 1,044
PRICE PER CUT FT.: 4¢

This excellent blade was one of only three to crack the 1,000-ft. barrier in the endurance test. Given its reasonable price and good cutting quality, the Bosch finished near the top of the cost-effectiveness competition as well.



CMT 236.004.07

TEETH: 4/diamond
PRICE: $56
INITIAL CUT: Good
COMPLETE CUTS: 27
TOTAL LINEAR FT.: 972
PRICE PER CUT FT.: 5¢

This top-tier blade ranked fourth in overall endurance and second only to the Diablo in cutting speed. It left a smooth edge in the crosscut test and rated among the best in value.



HITACHI 18008

TEETH: 4/diamond
PRICE: $40
INITIAL CUT: Fair
COMPLETE CUTS: 12
TOTAL LINEAR FT.: 432
PRICE PER CUT FT.: 8¢

Although fairly cost-effective, this blade finished just under the median during the endurance test, and its cutting quality was merely adequate.



IRWIN 4935473

TEETH: 4/diamond
PRICE: $53
INITIAL CUT: Good
COMPLETE CUTS: 9
TOTAL LINEAR FT.: 324
PRICE PER CUT FT.: 15¢

This blade cut cleanly and showed adequate endurance, but it can't compete with similarly priced blades that lasted longer.



MAKITA A-90451

TEETH: 28/carbide
PRICE: $49
INITIAL CUT: Excellent
COMPLETE CUTS: 0
TOTAL LINEAR FT.: 15
PRICE PER CUT FT.: $3.07

Despite its carbide teeth, this blade gave an impressive performance during the crosscut test. It cut almost silently and finished in first place of all 19 blades. When faced with a stack of three planks, however, it was unable to make much headway.



MAKITA 721263-A

TEETH: 4/diamond
PRICE: $40
INITIAL CUT: Fair
COMPLETE CUTS: 14
TOTAL LINEAR FT.: 504
PRICE PER CUT FT.: 15¢

Although it cut more slowly than most of its competitors, this blade covered a decent distance before it finally dulled. But its high price removes it from the cost-effectiveness discussion.



MALCO FCCB7

TEETH: 4/diamond
PRICE: $55
INITIAL CUT: Fair
COMPLETE CUTS: 17
TOTAL LINEAR FT.: 612
PRICE PER CUT FT.: 8¢

This solid, no-frills contender cut adequately and turned in good endurance numbers, but its sticker price is too high to make it a great value.

Photos, except where noted: Rodney Diaz



DEWALT DW3193

TEETH: 6/diamond
PRICE: $39
INITIAL CUT: Fair
COMPLETE CUTS: 0
TOTAL LINEAR FT.: 18
PRICE PER CUT FT.: $2.06

This blade cut reasonably well in the single-sheet crosscut test but was unable to progress more than 6 ft. when faced with the stack of three planks.



GILA 1037250T04

TEETH: 4/diamond
PRICE: $55
INITIAL CUT: Good
COMPLETE CUTS: 21
TOTAL LINEAR FT.: 756
PRICE PER CUT FT.: 7¢

Like its two Gila siblings, this reasonably priced blade was an above-average performer. It cut cleanly and tied for sixth in overall endurance.



GILA 1037250T06

TEETH: 6/diamond
PRICE: $68
INITIAL CUT: Good
COMPLETE CUTS: 20
TOTAL LINEAR FT.: 720
PRICE PER CUT FT.: 9¢

Another solid competitor from Gila, this blade finished a whisker behind its four-tooth brother. Perhaps more than any other blade, the Gila products showed the widest variation in pricing, but Gila's website offered the lowest prices.



GILA 1037250T08

TEETH: 8/diamond
PRICE: $91
INITIAL CUT: Excellent
COMPLETE CUTS: 24
TOTAL LINEAR FT.: 864
PRICE PER CUT FT.: 11¢

All three Gila blades finished the endurance test in a clump, with this one cutting more siding than its siblings. It showed excellent cutting quality, but its higher price tag made it the least economical of the three.



GRIP-RITE GRFC7144T

TEETH 4/diamond
PRICE $35
INITIAL CUT Fair
COMPLETE CUTS 16
TOTAL LINEAR FT. 576
PRICE PER CUT FT. 7¢

This solid, middle-of-the-pack blade turned in respectable numbers for endurance, cutting quality, and cost-effectiveness.



OLDHAM 725FC04

TEETH: 4/unspecified (probably carbide)
PRICE: $25
INITIAL CUT: Fair
COMPLETE CUTS: 0
TOTAL LINEAR FT.: 6
PRICE PER CUT FT.: $3.50

We included this blade due to prior positive experience with Oldham's products. However, reputations don't cut fiber cement. The blade's cutting quality was merely adequate, and it wasn't able to progress beyond a couple of feet into the stack of three planks.



OSHLUN SBH-072504

TEETH: 4/diamond
PRICE: $40
INITIAL CUT: Excellent
COMPLETE CUTS: 15
TOTAL LINEAR FT.: 540
PRICE PER CUT FT.: 6¢

This low-priced blade left an above-average edge in the cutting-quality test. It also lasted long enough to make it one of the better values in the field.



TASK T22426

TEETH: 4/diamond
PRICE: $53
INITIAL CUT: Fair
COMPLETE CUTS: 5
TOTAL LINEAR FT.: 180
PRICE PER CUT FT.: 29¢

This blade cut adequately in the crosscut test and managed to cover some ground in the endurance segment, but its numbers weren't good enough to offset its high price.



TENRYU BP-18505

TEETH: 5/diamond
PRICE: $53
INITIAL CUT: Excellent
COMPLETE CUTS: 41
TOTAL LINEAR FT.: 1,476
PRICE PER CUT FT.: 4¢

This excellent blade finished as the runner-up in almost every category. It was second-best in the endurance, cost-effectiveness, and quality-of-cut tests. Before it began to show signs of wear, it was astonishingly quiet. Buy this one if the Diablo is out of stock.



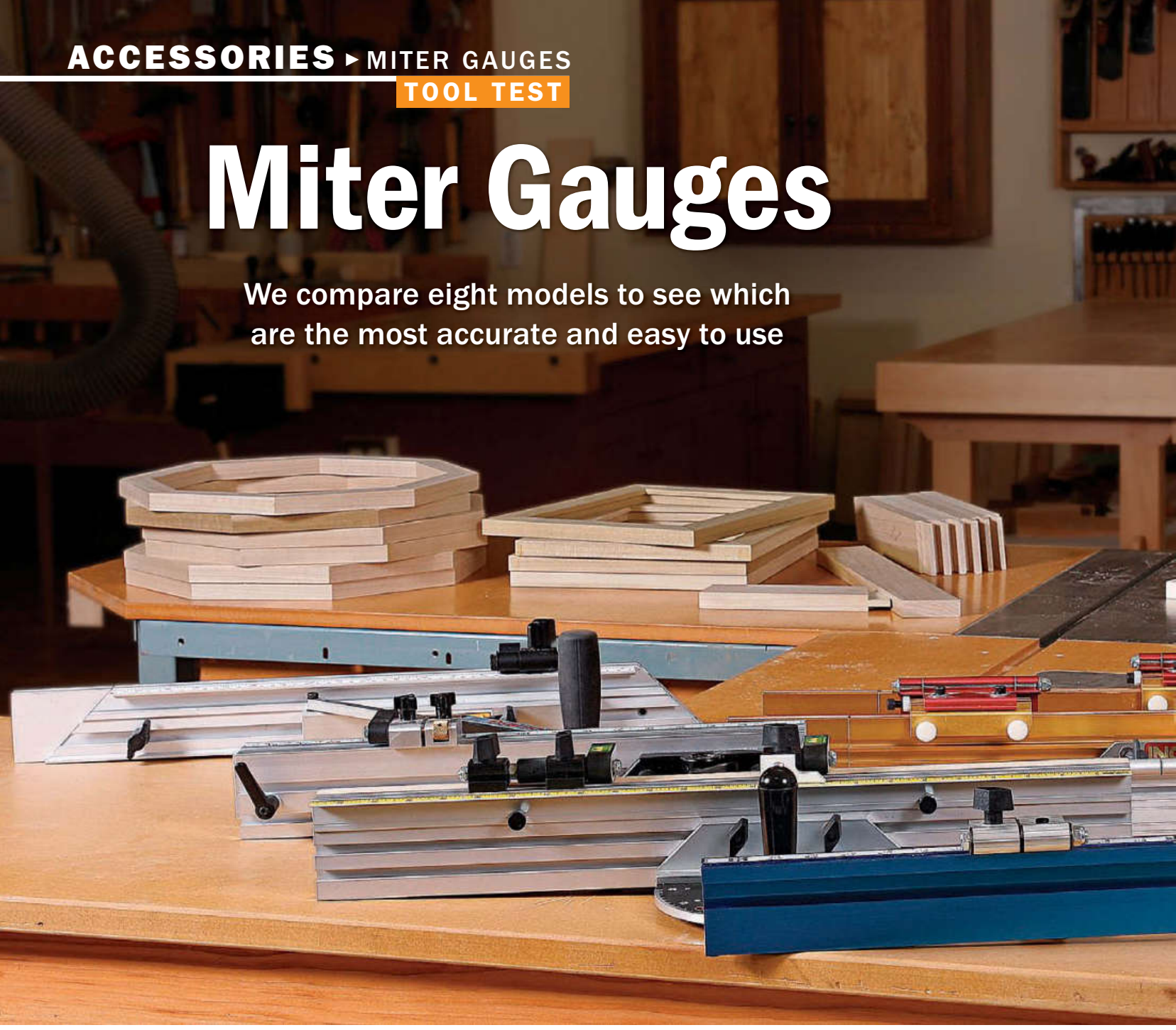
TENRYU BP-18524

TEETH: 24/carbide
PRICE: $23
INITIAL CUT: Fair
COMPLETE CUTS: 0
TOTAL LINEAR FT.: 6
PRICE PER CUT FT.: $3.83

To be fair, this blade came with a reminder that it was designed to cut single planks, so it wasn't surprising when it scarcely ripped 2 ft. into the stack of planks. However, it seemed to struggle even during the single-sheet crosscut test.

Miter Gauges

We compare eight models to see which are the most accurate and easy to use



A great tablesaw setup needs a great miter gauge. This accessory ensures safe, accurate crosscuts on boards and small panels and is great for joinery cuts, too. Unfortunately, the gauges provided with most tablesaws often are less than ideal. That's where a high-quality, aftermarket gauge comes in. We put eight fully equipped gauges (with extruded aluminum fences) through the gauntlet.

What makes a good miter gauge

A tablesaw's miter gauge has three main parts that must work well together to ensure accuracy as you work: a bar, a head, and a fence.

Miter bar keeps the gauge on track—If the miter bar that guides the gauge doesn't fit in the tablesaw's miter slot, any play will throw it out of line with the sawblade. This gives you inaccurate angles and joints that fit poorly. To remedy this, most gauges feature a way to adjust the fit of the bar so that it slides smoothly in the track.

Head ensures accurate angles—The head is the key to accurate square or angled cuts. Its scale must be precise and easy to read. Positive stops, or detents, at common angles are a plus. Adjustments should be quick and easy, yet solid enough to avoid being bumped from a setting.

Sturdy fence that's versatile—Easily adjustable fences are a necessary component of a quality aftermarket gauge, both for safety and for increased accuracy and repeatability. Fences support the stock during the cut, so they should be solid and not slippery, to ensure the stock doesn't drift.

Putting the gauges to the test

A straight-cut test ensured the 0° setting on the head was perpendicular to the blade.

Photos: Dillon Ryan



A CUT ABOVE THE REST

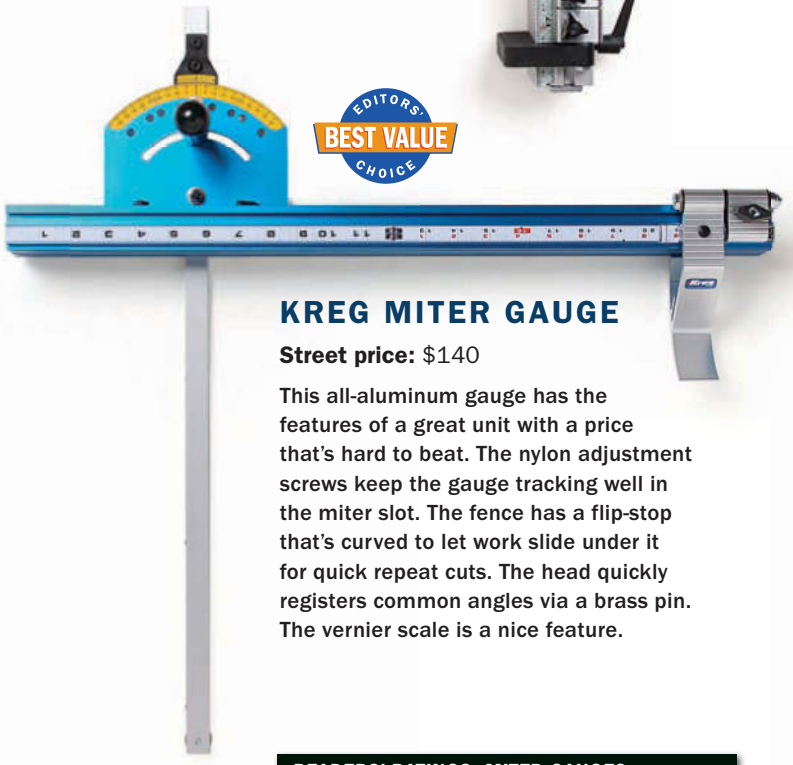
JDS ACCU-MITER

Street price: $230

EDITORS' CHOICE BEST OVERALL



The traditional, protractor-style head on this robust gauge registers angle detents solidly with a spring-loaded pin. The sturdy telescoping fence holds stock well, and it comes with a micro-adjustable flip-stop and a flip-down stop on the end of the telescoping section. The rigidity of the fence and the weight of the head ensured extra-smooth action.



EDITORS' CHOICE BEST VALUE

KREG MITER GAUGE

Street price: $140

This all-aluminum gauge has the features of a great unit with a price that's hard to beat. The nylon adjustment screws keep the gauge tracking well in the miter slot. The fence has a flip-stop that's curved to let work slide under it for quick repeat cuts. The head quickly registers common angles via a brass pin. The vernier scale is a nice feature.

We used each gauge to cut a piece of poplar in half, then placed the halves edge-down on the tablesaw and flipped one over. Flipping the piece doubles any error and exaggerates how off the gauge is.

For the second test, we used each gauge to make an 11-in. by 14-in. picture frame. This tested the gauge's accuracy at one of the most common angles used, a 45° miter, and also gave us the chance to use the flip-stops to make repeat cuts.

We also made an octagon with 7-in. sides using the 22.5° setting on the gauges and the flip-stops once again. This tested the head's accuracy and how easy it was to use the gauge with smaller stock. The octagon shape exaggerated any inaccuracies in the angles, making even a small error more obvious.

Finally, for a long stock test, we crosscut a piece of poplar, 1¼ in. thick by 6 in. wide by 60 in. long, and checked whether the fence deflected, if the board slipped on the fence face, and whether the fence helped "hold" the stock during the cut.

Furniture maker Chris Gochnour contributed to this article.

READERS' RATINGS: MITER GAUGES

Readers put the Incra 300SE at the head of the pack, while the editors' choices scored in the middle of the group.

4.50	INCRA 3000 SE
4.47	INCRA 1000 HD
4.37	INCRA 1000 SE
4.35	JDS ACCU-MITER
4.30	OSBORNE EB-3
4.26	KREG
4.23	WOODHAVEN 4911K
4.02	RIDGID DIGITAL MITER GAUGE

MITER GAUGES PUT TO THE TEST

Straight cuts. *To test the gauges' 0° setting, we made simple crosscuts. The good news is that every gauge tested made a perfectly straight cut at 0°.*

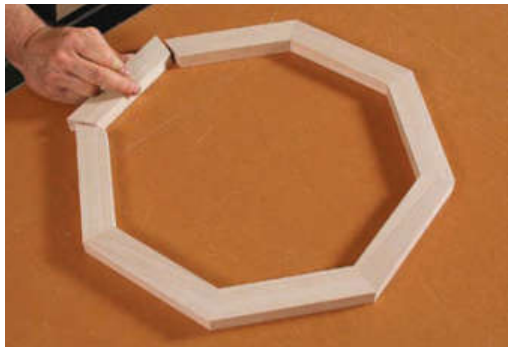


Miter test. *To test the accuracy of miter cuts, flip-stops, and head settings, we made picture frames. An accurate gauge will cut equal-length pieces.*

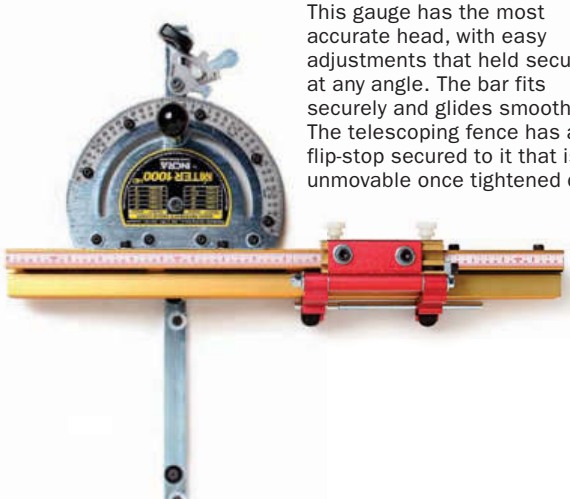


The octagon test. *To make octagonal frames we used the 22.5° detent and the stops. This tested the accuracy of the detent system and the stops as well as each gauge's ability to handle smaller stock. If everything works as it should, the result will be geometrically perfect with gap-free joints.*



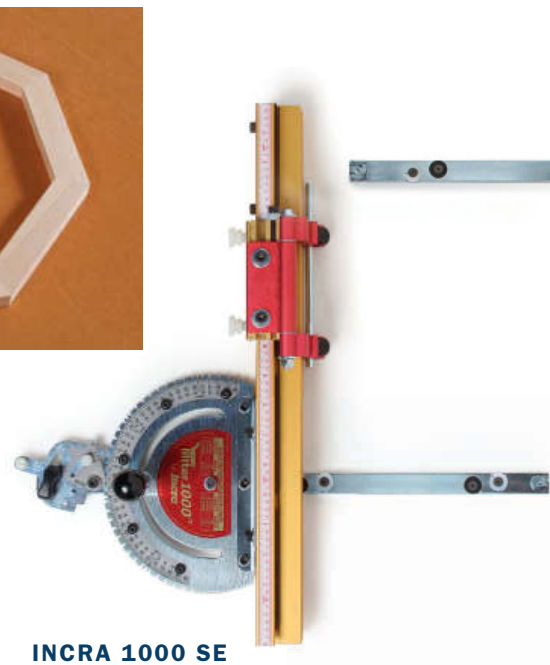


MODEL	STREET PRICE	BAR ADJUSTMENT
Incra 1000 HD	$190	Good
Incra 1000 SE	$150	Good
READERS' CHOICE Incra 3000 SE	$290	Good
EDITORS' BEST OVERALL CHOICE JDS Accu-Miter	$230	Very good
EDITORS' BEST VALUE CHOICE Kreg	$140	Excellent
Osborne EB-3	$120	Very good
Ridgid Digital Miter Gauge	$90	Fair
Woodhaven 4911K	$165	Excellent



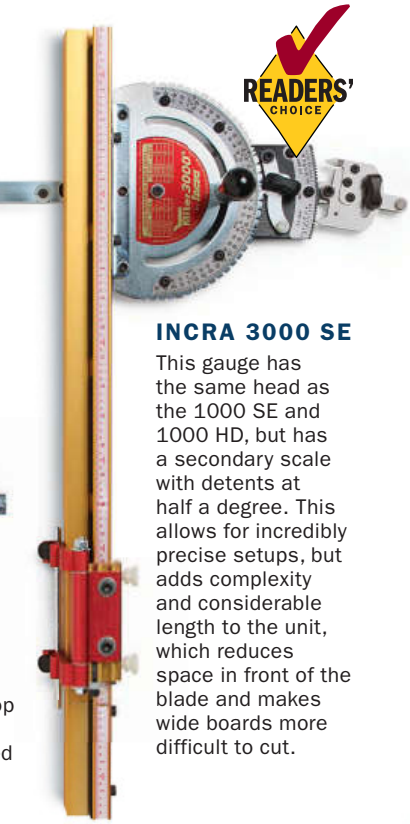
INCRA 1000 HD

This gauge has the most accurate head, with easy adjustments that held securely at any angle. The bar fits securely and glides smoothly. The telescoping fence has a dual flip-stop secured to it that is unmovable once tightened down.



INCRA 1000 SE

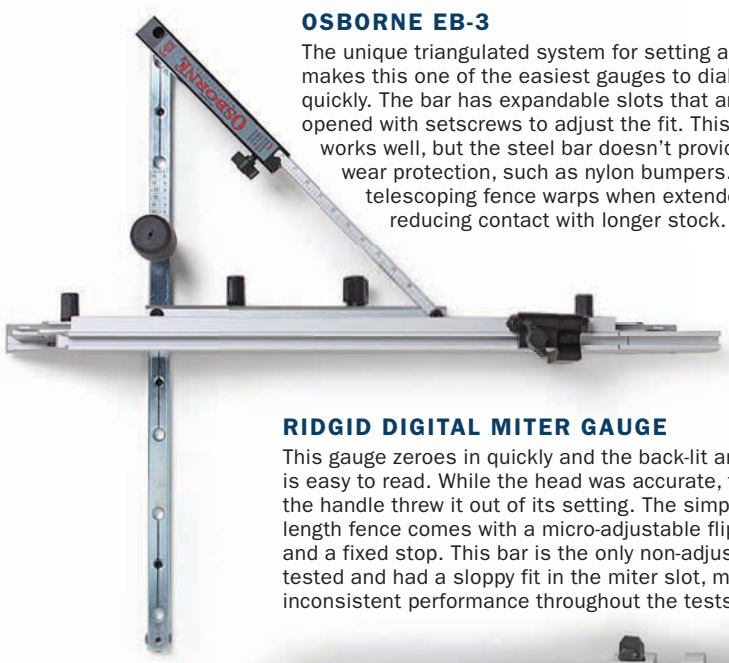
The gauge has the same miter bar, fence, and flip-stop as the other Incra gauges, but the 1000 SE's head only has detents every 5°. While this gauge performed well, it lacks the ease of fine adjustment, down to individual degree, that the 1000 HD has.



INCRA 3000 SE

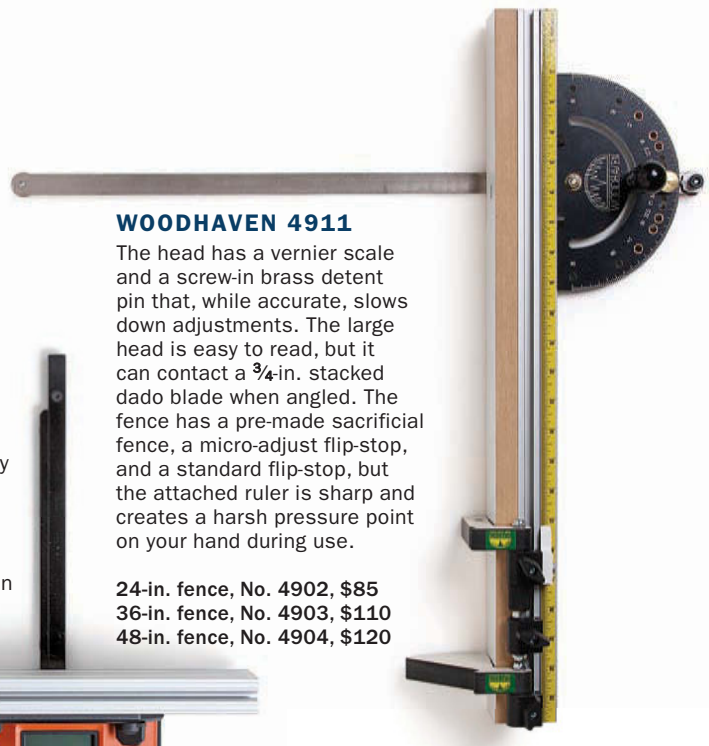
This gauge has the same head as the 1000 SE and 1000 HD, but has a secondary scale with detents at half a degree. This allows for incredibly precise setups, but adds complexity and considerable length to the unit, which reduces space in front of the blade and makes wide boards more difficult to cut.

DETENT USABILITY AND RANGE	FENCE QUALITY/RANGE	FLIP-STOP QUALITY	MITER TEST	LONG STOCK TEST	OCTAGON TEST
Excellent, 0°-90° in 1° increments	Good 18 to 31 in.	Very good	Very good	Good	Excellent
Very good, 0°-90° in 5° increments	Good 18 to 21 in.	Very good	Very good	Good	Excellent
Very good, 0°-90° in ½° increments	Good 27 to 49 in.	Very good	Excellent	Good	Excellent
Very good, detents at 0°, 15°, 22.5°, 30°, 45°	Excellent 18 to 34 in.	Excellent	Excellent	Good (excellent with optional clamp)	Excellent
Good, detents at 0°, 10°, 22.5°, 30°, 45°	Good 24 in.	Good	Very good	Good	Very good
Very good, 0°-45° in 5° increments, and 22.5°	Fair 24 to 42 in.	Fair	Good	Good	Excellent
Digital, in increments of 1/10°	Fair 24 in.	Fair	Fair	Very good	Fair
Fair, detents at 0°, 10°, 15°, 22.5°, 30°, 45°, 60°, 90°	Good 24 In.	Excellent	Excellent	Good	Excellent



OSBORNE EB-3

The unique triangulated system for setting angles makes this one of the easiest gauges to dial in quickly. The bar has expandable slots that are opened with setscrews to adjust the fit. This works well, but the steel bar doesn't provide any wear protection, such as nylon bumpers. The telescoping fence warps when extended, reducing contact with longer stock.



WOODHAVEN 4911

The head has a vernier scale and a screw-in brass detent pin that, while accurate, slows down adjustments. The large head is easy to read, but it can contact a ¾-in. stacked dado blade when angled. The fence has a pre-made sacrificial fence, a micro-adjust flip-stop, and a standard flip-stop, but the attached ruler is sharp and creates a harsh pressure point on your hand during use.

24-in. fence, No. 4902, $85
36-in. fence, No. 4903, $110
48-in. fence, No. 4904, $120

RIDGID DIGITAL MITER GAUGE

This gauge zeroes in quickly and the back-lit angle display is easy to read. While the head was accurate, tightening the handle threw it out of its setting. The simple, fixed-length fence comes with a micro-adjustable flip-stop and a fixed stop. This bar is the only non-adjustable one tested and had a sloppy fit in the miter slot, making for an inconsistent performance throughout the tests.



ALL ABOUT

The Indispensable Digital Multimeter

This tool is a must-have for electrical troubleshooting



If you had to carry only one device for electrical work, we would recommend a digital multimeter (DMM). Most of the other electronics we carry are adjuncts that do some of the same things a basic, quality multimeter can do. Available in various shapes and sizes, these fairly small, stout boxes consist usually of a display, wire leads that attach to the item being tested, and switches or knobs to choose between multiple metering functions—hence the tool's name.

The original multimeters were analog, and they used a needle and gauge (like a speedometer in your car) to give readings. Digital multimeters are now more common; they use an LCD screen to display readings with numerical values. Quality and functions differ from one model to another, and prices vary accordingly.

Electrician Brian Walo contributed to this article.

STYLE Some meters include a split fork, a hook, or a clamp that allows you to measure the amps running through a wire or cable without having to expose the conductors. All three styles do essentially the same thing, but each has a niche. Fork meters can fit into tighter spaces, which is helpful when cables are run close together. Meters with hooks or clamps make hands-free operation easier.



FORK HOOK CLAMP

LEADS Most, if not all, DMMs come with probe-tipped leads. Some more expensive models include alligator clips, which can be attached to conductors rather than having to be held in place.



Bottom photos this page, from left: first, third, and fourth, courtesy of Milwaukee; second, courtesy of Klein Tools. Photos facing page: top right, courtesy of Milwaukee; bottom left, courtesy of Klein Tools.

A sparky's sidekick

The quality of a digital multimeter and the features it offers are going to play a driving role in cost, so you don't want to buy more meter than you're going to need. (The Amprobe AM-60, shown here, costs $60.) We understand the desire to buy the best. But even though all the available bells and whistles sound really cool, you probably won't need a DMM capable of measuring 1,000 amps for your next remodel. Functions we consider useful but not strictly necessary are temperature and noncontact voltage detection. Don't spend extra on a DMM with these functions because other tools do the same things and cost less. That said, there are some basic functions that are must-haves for residential work.

ACCURACY Digital multimeters commonly have an accuracy of ±0.5%. Unless a multimeter is listed as "true RMS," it can be assumed to be an "average-responding" tool. Electricity travels through wiring in waves, so an average-responding meter essentially takes an educated guess at how much current is flowing based on the assumption of a perfect waveform of electricity. True-RMS meters take actual measurements but are more geared for working with computers filled with semiconductors (or building a robot in your basement) than for doing residential electrical work.

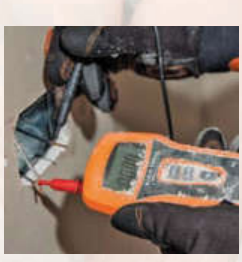
DISPLAY A simple lamplit display will get the job done, but if we recommend a model with a bright backlit or other high-contrast display, the bigger the better. Milwaukee's meters have a particularly nice white-on-black display.



MAX AMPS Choose a meter that can read slightly above the maximum service amperage in your area, just to be on the safe side.

RANGING Changing the range of the multimeter allows you to dial in the precision of the readout. If you're measuring a 120v circuit, it's more helpful to have the range of the multimeter set between 0v and 200v than it is to have it set between 0v and 1000v. It's also a matter of safety, as setting the range too low could mean blowing a fuse in the multimeter. With an auto-ranging meter, you don't have to think about setting the dial.

DURABILITY Like any electronic device, a multimeter typically doesn't like to be dropped, rained on, or left in the sun. But Klein's MM500 meter is sealed completely against dust and water and is designed to withstand up to a 10-ft. drop.



CATEGORY RATING Developed to ensure that the right diagnostic tools are used for the wide variety of applications, category ratings appear on all multimeters, ranging from category I (cable, telephone, etc.) to category IV (commercial and industrial power distribution). Category III is ideal for residential work and is approved for fixed installations such as residential panels, circuit breakers, wiring, receptacles, and fixtures.



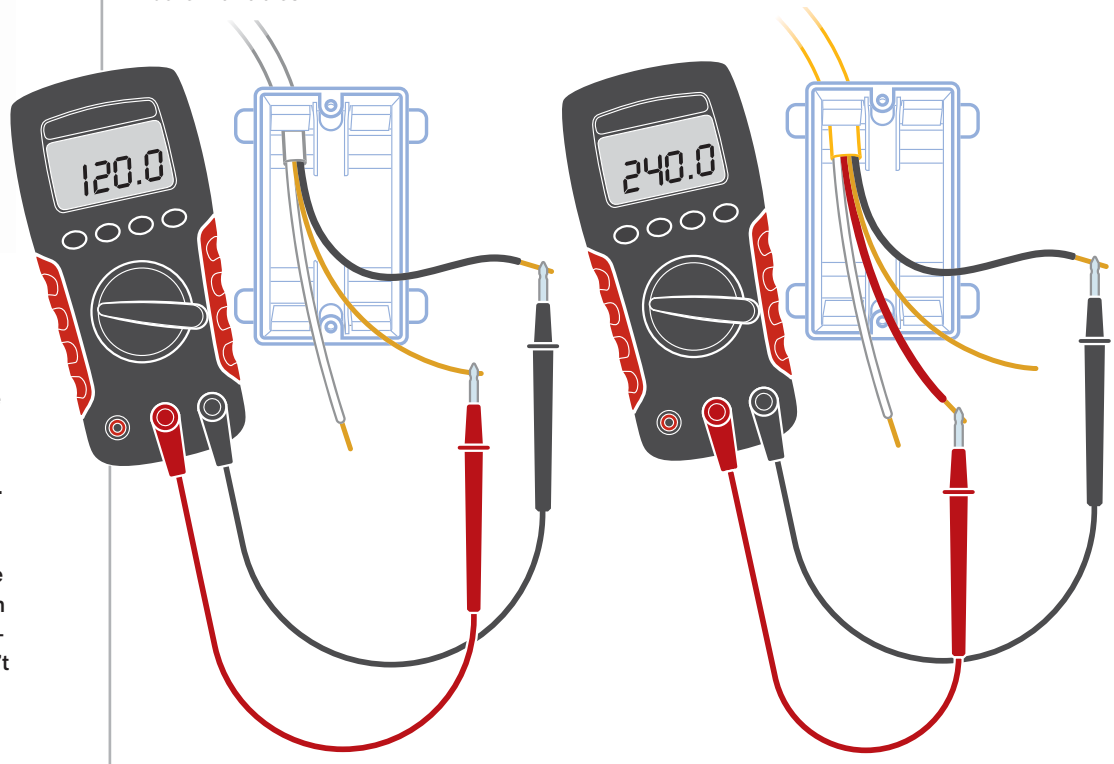


THREE KEY FUNCTIONS

Even the most basic, dirt-cheap multimeter is designed to measure at least three fundamental components of electrical energy: volts, amps, and resistance (ohms). You can't get by without these three basic functions, and aside from the very cheapest of available options, which might not include an a.c.-voltage function, you'd be hard-pressed to find a meter that doesn't do all three.

If you think of electricity like water flowing through a pipe, volts would be like the pressure (electrical "psi"), the amps would be like the number of gallons per minute (electrical "volume"), and resistance would be akin to anything limiting water flow, such as pipe diameter or obstructions inside the plumbing.

Voltage Our appliances and devices are designed to operate at specific voltages, such as the 120/240-volt services supplied to millions of U.S. homes. Anything above that designed voltage can result in catastrophic damage, which is why surge protectors are so important for computers and other electronic devices. Voltage drop, which is when the voltage reaching a device is less than designated, is also a concern. This can be caused by bad wire splices or junctions, loose connections within the circuit or on the panel, oxidation or corrosion of a connection or conductor, wiring that's too small for the load being carried, and many other variables.



IN USE: First, set your multimeter to a.c. voltage. Touch one of the leads to the neutral or ground wire*, and touch the other lead to the suspected hot wire. The meter will indicate what voltage is present within the conductors. A 120v circuit should read 120v between hot and neutral or hot and ground, and 0v between neutral and ground. A 240v circuit should read 240v between the two hot conductors, and 120v between each of the hot conductors and the ground. If the 240v circuit has a neutral wire (typical for appliances like ovens and dryers), you should get 120v between black and ground or black and neutral, and 120v between red and ground or red and neutral.

*It's good practice to check for voltage against both the ground and the neutral conductors in the event that one is damaged or malfunctioning and would give a false negative.

ANALOG VS. DIGITAL

Analog and digital multimeters (DMMs) each have their pros and cons, but we'll take a stout DMM over an analog model any day of the week. Because analog meters have moving parts that must be calibrated, they're more delicate and susceptible to damage from the rigors of job-site use. Also, unlike DMMs, analogs generally have to be set manually to a specific range for measurements, which can lead to incorrect readings or even damage to the meter if you're not paying careful attention to the settings or where the leads are plugged in. Still, it's worth noting that although DMMs offer more consistent results, they aren't always as true to reality as a comparable analog meter with similar specs. DMMs also can pick up "phantom" voltage—nonexistent voltage induced into a circuit by other nearby sources—that analog meters won't register. We'd still rather have a DMM, since they're easier to read and are less sensitive to the beatings doled out on the job site every day. We've also found that you can get a good-quality digital meter with numerous features for less than a good-quality analog these days.

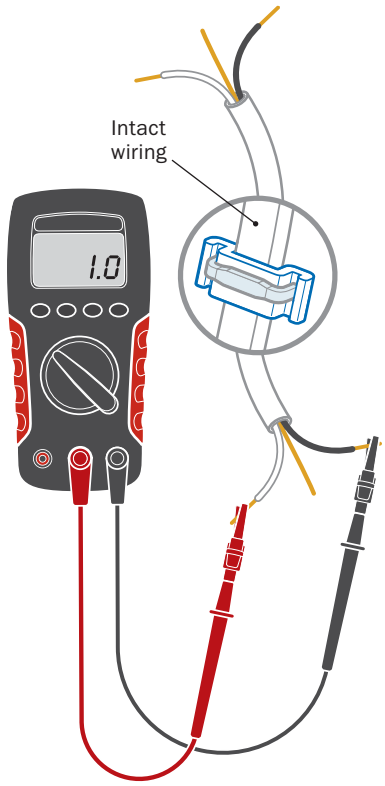


Photos, except where noted: Rodney Diaz; drawings: Trevor Johnston

Ω Resistance Measured in ohms, resistance is what slows down the flow of electricity and creates heat. Therefore, it's helpful to know what, if any, resistance is present in your wiring that should not exist.

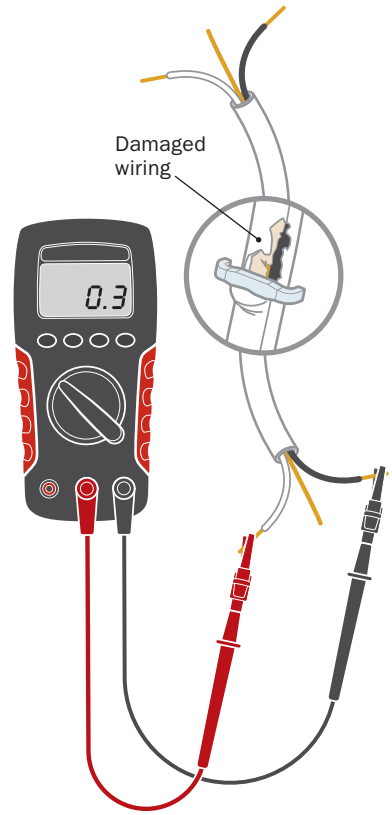
Resistance can be created by anything that changes the characteristics of the device or wiring connected to it. For example, a staple that's overdriven to the point of damaging the wire, wiring that's too small for the breaker it's attached to, corrosion on conductors and devices, or poor connections can all lead to resistance.

Continuity is the ability of electricity to flow through a component. It's measured by way of the resistance of the wiring and/or device. A multimeter's continuity function can tell you whether there's a fault in a run of wiring, can be used to trace runs of wiring between workboxes, and can allow you to test the function of devices such as toggle switches, which have to be completely disconnected from all wiring.



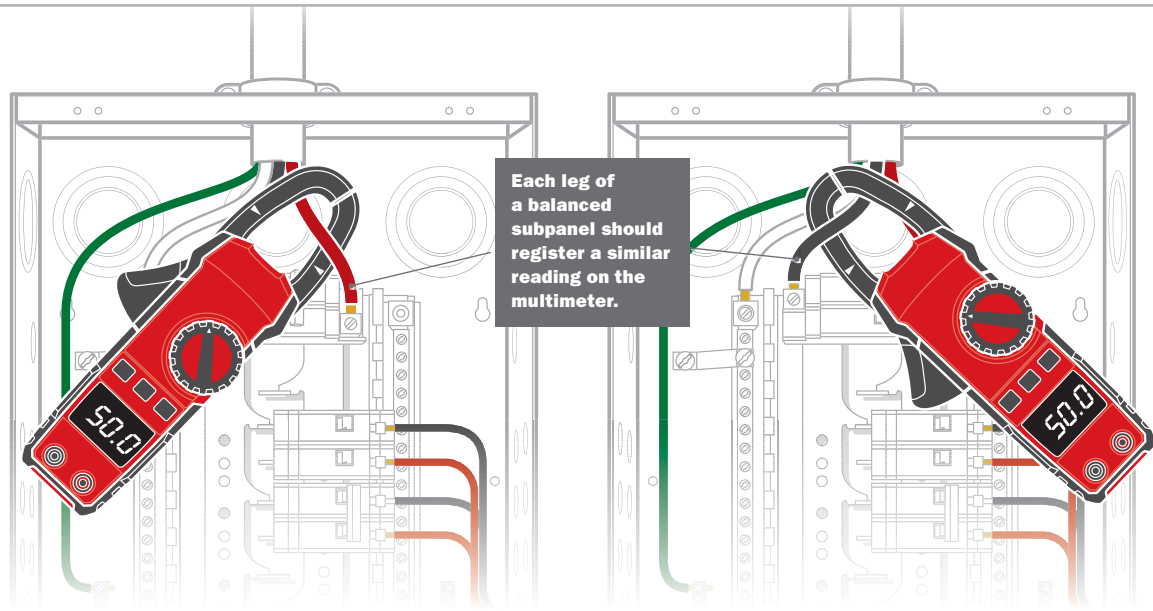
IN USE: To check a wire for a fault, it must first be completely de-energized and disconnected from all other wiring. Clip one lead to the hot conductor and one to the neutral conductor. As long as the opposite ends of the wiring aren't touching anything, most meters will read 1* (for infinite resistance) in a perfectly intact section of wiring. If you get a reading other than 1, there is something in that run of wiring that's bridging the hot and neutral. This could be an errant drywall screw or an overdriven staple that has damaged the insulation and allowed a fault in the line.

*Verify the reading in your DMM's manual.



Ã Amps While voltage remains more or less constant, amperage varies based on use. For instance, if you have a toaster plugged into the wall, your multimeter will show voltage running through the wire, but if the appliance is off, no amps will be flowing through the wire.

Amps are important because they measure how much electricity you're using when you turn on the oven or when the air conditioner cranks up. Having too many amps running through a circuit creates friction (resistance), which creates heat. If the breaker doesn't trip soon enough, a fire could start.



Each leg of a balanced subpanel should register a similar reading on the multimeter.

We use the amp function most often to balance the load in a breaker panel. If you have a lot of equipment on one leg of the service and the other leg isn't carrying anything, your neutral has to carry a more substantial load, which wastes energy and may create an overload. This is more of a problem with heavy 120v loads (such as those from a tablesaw or a window air conditioner) than for 240v circuits on a double-pole breaker.

If you expect to do this type of work, we recommend using a clamp-on meter because it allows you to check amperage safely without having to touch any exposed conductors.

IN USE: Without touching any bare conductors, and while everything is off, remove the cover to your subpanel. Insert one leg of the wire feeding the panel into the jaw of the meter. Turn everything on, and write down how much current is being used. Power everything off, and do the same to the other leg of the feeder. Compare the two results to see how close to balanced you really are, and adjust circuits from one leg to the other as necessary if the loads are drastically different. Try to put things that run at about the same time on opposite legs. For instance, a one-man shop won't need enough amps to run the tablesaw at the same time as the thickness planer, but it may be likely that the tablesaw and dust collector are running simultaneously.

Paint Strippers

Safer products get the job done, but unfortunately, the fastest are the most toxic

Most of us are all too familiar with the scraping, sanding, and caulking that are part of the prep work for repainting. But when your next renovation calls for stripping the kitchen cabinets back to bare wood or uncovering some architectural details that have been hidden beneath too many touch-ups, you can be excused for being a little unsure about your next step. You know you need some kind of chemical stripper, but choosing the right product isn't easy. We've taken a close look at 10 commonly available paint strippers that span the spectrum of toxicity and ease of handling.



The test piece. *An old, heavily painted antique door provided a perfect mix of flat surfaces and detailed molding for the product trials.*

The results: Do you want speed or safety?

All the products in this roundup were able to get the job done. If time is short, methylene-chloride strippers are the best option. If the only criteria you're concerned with are speed and effectiveness, they won this race hands down. When used cautiously, they'll yield quick results without frying your brain. Our top pick from the field is Klean-Strip's KS-3 Premium Stripper, which went to work almost immediately and stripped its panel faster than any other product. The other three methylene-chloride strippers were nearly as fast and would also be good choices. We would turn to Dumond's Peel Away 1 for large or intricate surfaces, and for its excellent control of lead paint.

The safer paint strippers weren't nearly as fast as their more toxic brethren, but they might still be the best choice for your next project. If you're working indoors and have plenty of time, or if the task is fairly light and your personal safety is paramount, there are plenty of good choices available. All of the less toxic products quickly cut through the first two layers of paint and then slowed down, but the clear frontrunner was the Citristrip Safer Paint and Varnish Stripping Gel. The Franmar and Mötsenböcker products were nearly as good and finished close behind.

Andy Beasley contributed to this article.

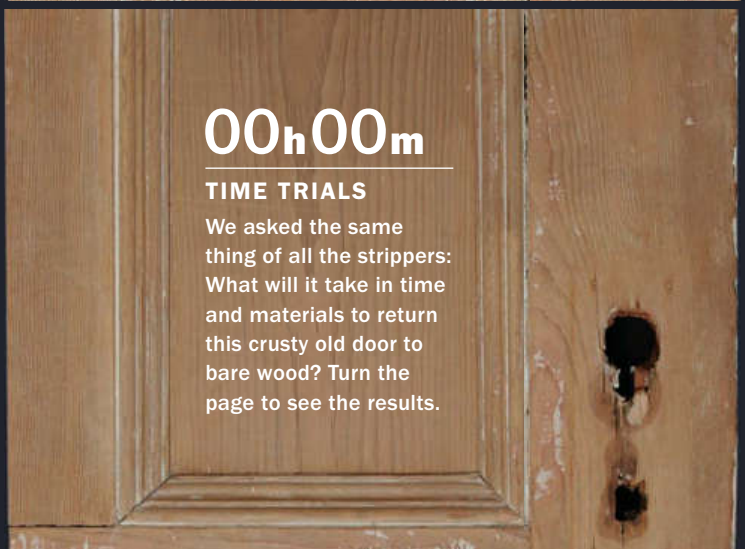
READERS' RATINGS: PAINT STRIPPERS

Readers judged the Dumond Peel-Away 1 as the best of the bunch, while the editors' choice, Klean-Strip, scored in the middle of the group.

★★★★☆	3.95	DUMOND PEEL AWAY 1
★★★★☆	3.89	FRANMAR SOY GEL PAINT STRIPPER
★★★½☆	3.68	ZINSSER MAGIC STRIP PAINT & VARNISH REMOVER
★★★½☆	3.63	ZINSSER POWER STRIPPER
★★★½☆	3.59	KLEAN-STRIP PREMIUM STRIPPER
★★★½☆	3.57	CITRISTRIP SAFER PAINT & VARNISH STRIPPING GEL
★★★½☆	3.56	3M SAFEST STRIPPER PAINT & VARNISH REMOVER
★★★½☆	3.55	ZAR PAINT & VARNISH REMOVER
★★★½☆	3.45	SAVOGRAN STRYPEEZE ORIGINAL
★★★☆☆	3.20	MOTSENBOCKER'S LIFT OFF PAINT & VARNISH REMOVER







00h00m

TIME TRIALS

We asked the same thing of all the strippers: What will it take in time and materials to return this crusty old door to bare wood? Turn the page to see the results.

Lion or lamb?



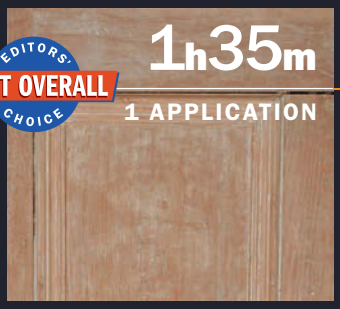
WHEN CHOOSING A CHEMICAL PAINT STRIPPER, the first question most people ask is about the product's toxicity. We all want good performance, but not if that means we won't be able to balance a checkbook after we put the can of stripper back on the shelf. While we're not chemists, we do know there's a toxicity spectrum, and there is no such thing as a perfectly safe paint stripper. All require some level of personal protection for skin, eyes, and lungs. The 10 products we tested feature ingredients ranging from relatively benign soybean extracts to the seriously hazardous methylene chloride. Although the chemicals differ, all seek to penetrate built-up coats of paint and ultimately weaken the bond between the bottom layer and the substrate.

UNAPOLOGETICALLY TOXIC

Most of the products that promise the fastest results—such as Klean-Strip's Premium Stripper or Zinsser's Power Stripper—rely on methylene chloride and a supporting cast of solvents to do the heavy lifting of paint removal. These are serious chemicals and threaten the user with various degrees of skin, lung, and brain damage unless proper precautions are taken. These requirements include heavy gloves, splash goggles, and a good respirator (not a dust mask). It's best to work outdoors, away from people and pets, and to have a supply of water on hand for emergencies. If this chemical splashes on your skin, you'll know it. Dumond's Peel Away 1, a zero-VOC formulation, is a partial exception. It doesn't produce the dangerous fumes of the methylene-chloride products, but it can still cause serious burns.

SAFE IS A RELATIVE TERM

The safer strippers still can be hazardous to breathe or to get on your skin, but the products in this category are like chemical child's play compared to the methylene-chloride concoctions. With proper ventilation, they're a good choice if you must work indoors. Although slow, they tend to stay active longer and can be left alone to work overnight. (In these cases, it's usually best to cover them with plastic wrap to keep the product moist and active.) Use this option sparingly, however, because these long contact periods can soften underlying wood surfaces and make them more susceptible to damage from scraping tools. Similarly, to minimize the risk to veneered surfaces, be sure to follow each manufacturer's instructions for limiting application times.

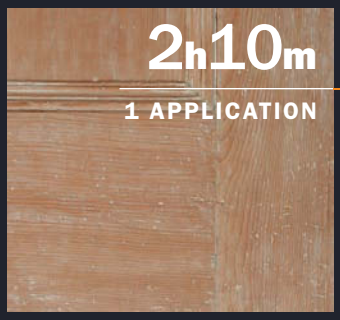


KLEAN-STRIP PREMIUM STRIPPER

$9 per qt.

If you feel the need for speed, this is your choice. It began peeling up the top paint layer within three minutes and had fully stripped the test piece in a single application of 1 hour and 35 minutes. The methylene-chloride formula demands serious personal protection and should be used outdoors. Its jellylike consistency is difficult to spread into an even coat, and it will sag when applied vertically.





ZINSSER POWER STRIPPER

$16 per qt.

A methylene-chloride product for outdoor use, Power Stripper turned in the second-fastest time of the test, finishing off its test piece with one application of 2 hours and 10 minutes. Its clear formula is easy to brush, and it's best applied in thin coats when used on vertical surfaces. Its wet and glistening appearance makes it easy to identify dry spots that need touching up.



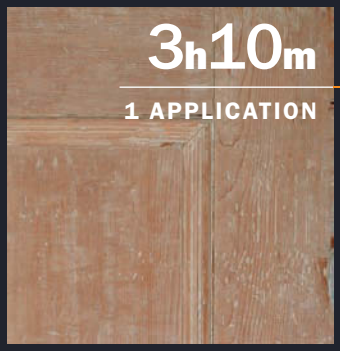


ZAR PAINT & VARNISH REMOVER

$13 per qt.

This methylene-chloride stripper cooked through the top two layers of paint in less than 10 minutes and finished the entire test piece with one application of 2 hours and 20 minutes. It pours easily with the consistency of thick, stringy syrup, but heavy coats run when it's used vertically. The clear formula makes it easy to follow the stripper's progress, and equally easy to overlook dry spots. It should be used outdoors.





SAVOGRAN STRYPEEZE ORIGINAL

$12 per pint

Although the slowest of the methylene-chloride strippers, Strypeeze still whipped our test with only one application of 3 hours and 10 minutes. Its fairly runny formula means that vertical surfaces are best attacked with thin coats. The light orange color shows what you've covered and reveals what you've missed. In addition to carrying the typical toxic-vapor risks—which is why it should be used outdoors—its solvents are highly flammable and must never be exposed to sources of ignition.





DUMOND PEEL AWAY 1

$43 per 1¼ gal. (includes remover, paper, plastic scraper, and neutralizer)

Although it ranked well behind the methylene-chloride strippers, this unique paste-and-paper product has advantages. This water-based, low-odor stripper can be used indoors or out, although it's still nasty enough to cause skin burns. It was the easiest to apply and was the best on vertical surfaces. It works beneath a paper cover where you can't monitor its progress, but if you nail the correct time to peel off the paper, the paint will come off with little or no scraping. This product can soften and permanently darken some wood species, however, so it's best to check if it's right for your project.



Photos: Rodney Diaz



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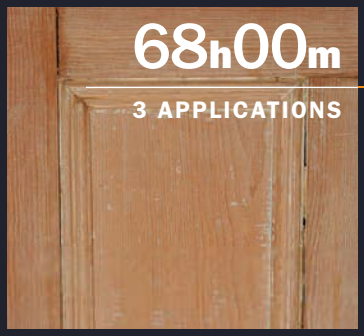
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68h00m

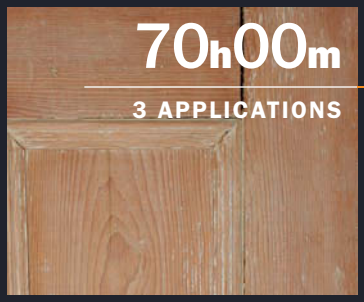
3 APPLICATIONS

CITRISTRIP SAFER PAINT & VARNISH STRIPPING GEL

$12 per qt.



This was the fastest product among the less-toxic strippers tested. It reached bare wood over the entire test piece after 68 hours and three long applications, and it recorded more progress at each stage of testing than any of the comparable products. It is appropriate for indoor use with good ventilation and adequate personal protection. The consistency is thick, but it sags on vertical surfaces. The orange color makes it easy to track where the stripper has been applied.



70h00m

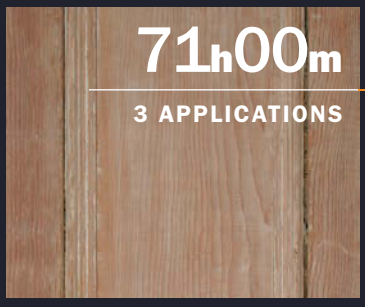
3 APPLICATIONS

FRANMAR SOY GEL PAINT STRIPPER

$25 per qt.



Requiring three applications and 70 total hours, the Franmar Soy Gel finished a close second among the safer products. With its fairly liquid consistency, it can be poured, brushed, or applied with an airless sprayer. The downside of this flexibility is a greater tendency to drip and run on vertical surfaces. It's a good choice for indoor use with adequate precautions.



71h00m

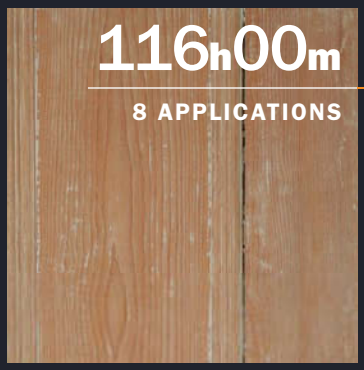
3 APPLICATIONS

MÖTSENBÖCKER'S LIFT OFF PAINT & VARNISH REMOVER

$12 per qt.



This water-based, indoor/outdoor stripper turned in a top-tier performance among the safer products; 71 hours and three applications were needed to strip the test piece. The no-drip container was the easiest of all to use; this was good because the product itself was runny and had little vertical cling. It dried more quickly than most of its competitors, which necessitated more-frequent touch-ups.



116h00m

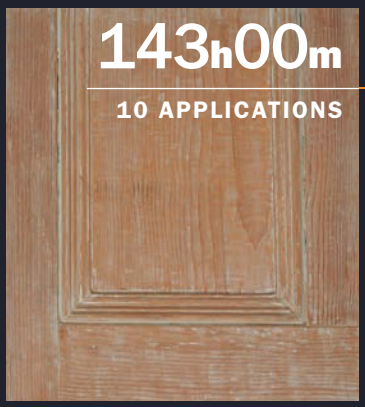
8 APPLICATIONS

3M SAFEST STRIPPER PAINT & VARNISH REMOVER

$13 per qt.



Judging by its low odor and minimal safety warnings, this product might well have lived up to its name as the safest stripper we tested. But safe doesn't mean fast, as it took eight applications and 116 hours to complete the job. The product is a creamy white goop that's easy to apply in a thick coat, though it sagged significantly on vertical surfaces. Although it finished the test near the bottom of the pack, its reasonably good performance on the test piece's first two layers of paint suggests that it packs enough punch for less challenging tasks.



143h00m

10 APPLICATIONS

ZINSSER MAGIC STRIP PAINT & VARNISH REMOVER

$17 per qt.



Every race has its last-place finisher, and this stripper earned that dubious honor. It loitered through 10 coats and 143 hours getting down to bare wood. Like 3M's Safest Stripper, the Zinsser Magic Strip eliminated the test piece's first two paint layers fairly quickly, so it has potential for light-duty work. It can be used indoors with adequate ventilation and a respirator, and it's also one of the few formulas compatible with fiberglass surfaces. Product consistency is very thick and is excellent for vertical surfaces. The manufacturer claims that the stripper will change color from green to pale green when it's ready to be scraped away, although we scarcely noticed the switch.

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